

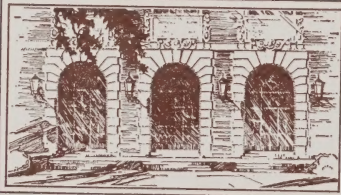
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IN FIFTEEN VOLUMES

Vol. XIII

NEW YORK

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1898

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SAFETY-LAMP. It has been long known that when marsh-gas or light carbureted hydrogen, which is frequently disengaged in large quantities from coal-mines, is mixed with seven or eight times its volume of atmospheric air, it becomes highly explosive, taking fire at the approach of a light, and burning with a pale blue flame. Moreover, this gas in exploding renders ten times its bulk of atmospheric air unfit for respiration, and the *choke-damp* thus produced is often as fatal to miners as the primary explosion. With the view of discovering some means of preventing these dangerous results, Davy instituted those important observations on flame which led him to the invention of the safety-lamp. He found that when two vessels filled with a gaseous explosive mixture are connected by a narrow tube, and the contents of one fired, the flame is not communicated to the other, provided the diameter of the tube, its length, and the conducting power for heat of its material, bear certain proportions to each other; the flame being extinguished by cooling, and its transmission rendered impossible. In this experiment, high conducting power and diminished diameter compensate for diminution in length; and to such an extent may this shortening of length be carried, that metallic gauze, which may be looked upon as a series of very short square tubes arranged side by side, completely arrests the passage of flame in explosive mixtures. The following are Davy's directions regarding the structure of his lamp: "The apertures in the gauze should not be more than $\frac{1}{12}$ of an inch square. As the fire-damp is not influenced by ignited wire, the thickness of the wire is not of importance; but wire from $\frac{1}{40}$ th to $\frac{1}{80}$ th of an inch in diameter is the most convenient. Iron-wire and brass-wire gauze of the required degree of fineness are made for sieves by all wire-workers, but iron-wire gauze is to be preferred; when of the proper degree of thickness, it can neither melt nor burn; and the coat of black rust which soon forms upon it superficially defends the interior from the action of the air. The cage or cylinder should be made of double joinings, the gauze being folded over so as to leave no apertures. When it is cylindrical it should not be more than two inches in diameter; for in larger cylinders the combustion of the fire-damp renders the top inconveniently hot, and a double top is always a proper precaution, fixed at the distance of half or three-quarters of an inch above the first top. The gauze cylinder should be fastened to the lamp by a screw of four or five turns, and fitted to the screw by a tight ring. All joinings should be made with hard solder; and the security depends upon the circumstance that no aperture exists in the apparatus larger than in the wire gauze." The cylinder is protected by three external, strong, upright wires, which meet at the top; and to their point of junction a ring is attached, by which the lamp is suspended. The oil is supplied to the interior by a pipe projecting from the cylinder, and the wick is trimmed by a wire bent at the upper end, and passed through the bottom of the lamp, so that the gauze need not be removed for this process. When a lighted lamp of this kind is introduced into an explosive mixture of air and fire-damp, the flame is seen gradually to enlarge as the proportion of light carbureted hydrogen increases, until at length it fills the entire gauze cylinder. Whenever this pale enlarged flame is seen, the miners should depart to a place of safety, for although no explosion can occur while the gauze is sound, yet at that high temperature the metal becomes rapidly oxidized, and might easily break; and a single aperture of sufficient size would then occasion a destructive explosion. In a strong current of air, the heated gas may be blown through the apertures of the gauze before its temperature is sufficiently reduced to prevent an explosion; but such a contingency may be guarded against by placing a screen between the draught and the lamp. It was in the year 1815 that sir Humphry Davy presented his first communication to the royal society respecting his discovery of the safety-lamp; and at the meeting held on Jan. 11, 1816, the lamp was exhibited. Sir Humphry Davy's claim as an original discoverer was immediately challenged by various persons, among whom may be especially noticed the late Dr. Reid Clanny, of Newcastle, and the great engineer, George Stephenson. Clanny's safety-lamp (which is described in the *Philosophical Transactions* for 1813) was based on the principle of forcing in air through water by bellows; but the machine was ponderous and complicated, and required a boy to work it; moreover, he had been anticipated by

Humboldt in 1796 (Weld's *History of the Royal Society*, vol. ii. p. 288, note). Notwithstanding a report of the royal society, dated Nov. 20, 1817, and signed by Joseph Banks, P.R.S., William Thomas Brande, Charles Hatchett, and William Hyde Wollaston, which is totally adverse to Stephenson's claims, there is undoubted evidence that, during the very months Davy was at work on the experiments which led to his invention, Stephenson's (familiarily called the *Geordy*) lamp was actually in use at the Killingworth mines. In its general principle it was the same as Davy's, the main difference being that the Stephenson lamp had a glass cylinder inside the wire-gauze cylinder, and that inside the top of the glass cylinder was a perforated metallic chimney; the air being supplied through a triple circle of small holes in the bottom. On the subject of this controversy, the reader is referred to Smiles's *Life of George Stephenson*. It has been generally agreed that there is a decided advantage in having a glass cylinder besides the gauze one, to resist strong currents of air; and that glass without gauze is not safe from fracture. In the French and Belgian collieries, Mueseler's lamp is in almost universal use. It consists of a glass cylinder immediately around the flame, and of wire gauze above. An internal metal chimney opening a short distance above the flame creates a strong upward draught, which causes the feed air to pass briskly down from the wire gauze, and so keeps the glass cool and insures thorough combustion. Mueseler's lamp is also used in a few English collieries; but modifications of Davy's, Stephenson's, and in a less degree of Clanny's later lamp are still in general use in England, the best kinds of each having their wire-gauze covers secured by patent lever locks. In the catalogue of the collection of scientific apparatus shown at South Kensington in 1876, there is given an interesting table with remarks, of the different forms of safety-lamps which either are or have been in use. It was compiled by the north of England institute of mining engineers.

Closely connected in its objects with the safety-lamp is a most ingenious invention patented by Mr. Ansell of the English mint. Its object is to determine, by a simple application of the law of osmotic force, the presence of light carbureted hydrogen in coal mines. Mr. Ansell gives two or three forms to his apparatus, of which the following is the most simple: A thin india-rubber ball is filled with atmospheric air, and is placed on a stand under a lever which slightly presses its upper surface. This lever is connected with a spring, which it liberates when, from any cause, the lever is raised; and the liberation of the spring sets a bell in vibration. If this trap for the discovery of fire-damp is set where that gas is present to any material extent, the noxious gas enters the ball by virtue of osmose, causes it to swell, and when the swelling has attained a certain point, the warning bell rings.

Within recent years the use of electricity has become very general in mines, both for lighting and power, and it is obvious that the incandescent lamp, as it burns *in vacuo*, must be perfectly safe in an atmosphere of any gas, however explosive. The only objection raised against the incandescent lamp for mines is that with proper insulation, suitable wiring, and the rough usage it receives, the expense of the light is very large in comparison to the wire gauze lamp. From time to time portable electric lamps for miners have been invented, but none of them have proved very practicable, owing to the difficulty of carrying a large enough battery to supply the light for a reasonable time, the tendency to get out of order with rough usage, and the high cost of the apparatus. A great many safety lamps have been invented to use as indicators of the amount of fire-damp in the atmosphere. Several of these lamps give indications through the sensitiveness of their flames. In an atmosphere of fire-damp the flame lengthens considerably, and above it is a slightly luminous aureole, whose length indicates quite accurately the proportion of fire-damp present.

SAFETY-VALVE is a circular valve placed on an opening in the top of a steam-boiler, and kept in its place either by means of weights piled above it, by a lever of the second kind, with a weight capable or sliding along the arm, or by a lever and spring. In stationary engines, one valve is frequently found sufficient, and the pressure on the valve is produced in the first or second of the methods indicated above. In locomotive engines, on the contrary, there are always two loaded valves: one called the *lock-up valve*, from its being out of the engineman's reach and control, is placed well forward on the top of the boiler, and kept down by weights; the other, on the hinder part of the top of the boiler, is for safety subjected to a less pressure than the lock-up valve, and is acted on by a lever and spring. The term "safety-valve" is particularly appropriate to this invention; for whenever the tension of the steam rises above a certain amount (= the weight in pounds with which the valve is held down divided by the area in inches of the under-surface exposed to the steam), the valve is forced upward by the superior pressure beneath, steam escapes, and the pressure on the boiler being thus relieved, the valve sinks to its place. The only precaution necessary is to be sure that the valves are not too heavily loaded or fastened. Another safety device sometimes used on boilers is a fusible plug, which is designed to melt and leave an escape for the steam when the boiler reaches a dangerous temperature.

SAFFI, AZAFFI, or ASFI, a seaport of n. Africa, in the kingdom of Morocco, and 102 m. w.n.w. of the city of that name. It is surrounded by waste and desert land; and its inhabitants, about 9000 in number, of whom 1500 are Jews, are said to be the

wildest, greediest, and most fanatical of the kingdom. It was at one time the chief seat of the trade with Europe, and though it has declined with the rise of Mogadore, it still exports a number of articles.

SAFFLOWER, *Carthamus tinctorius*, a plant of the natural order *compositæ*, allied to thistles (q.v.), but distinguished by its heads of flowers having only hermaphrodite florets, and the fruit having four ribs, and no pappus. It is an annual, 2 to 4 ft. high, branching toward the top; flowers dark orange, or vermilion. It is a native of the East Indies, from which it was probably introduced in a remote age into Egypt and the Levant, where it is now naturalized. It is extensively cultivated in France, and the more southern parts of Europe, and even in some parts of South America, chiefly on account of the corollas of the florets, which are used in dyeing yellow and red. In France, it is drilled or sown broadcast in the beginning of May. The plants are thinned to five or six inches apart; and the flowers are picked by the hand in dry weather, and very carefully dried on a kiln, under pressure, and are thus formed into small round cakes, in which state safflower appears in the market. The safflower of Persia is generally esteemed the best; but India yields the chief part of that imported into Britain. From its resemblance to saffron, safflower is sometimes called *bastard saffron*, and it is used to adulterate saffron. The yellow coloring matter of safflower is a kind of extractive. The red coloring matter is carthamine (q.v.). The coloring matter of rouge (q.v.) is derived from safflower.

The seeds of safflower are bitter and very oily. They are greedily eaten by parrots and many other birds. They are sometimes used as a purgative.

SAFFORD, TRUMAN HENRY, b. Vt., 1836; graduated at Harvard in 1854. He was remarkable when a boy for his astonishing power of mentally performing with wonderful rapidity mathematical problems, such as extracting cube roots of numbers having 8 or 10 places of figures. When less than 10 years old he made the calculations for an almanac; and in 1849 ascertained the elliptic elements of the comet of that year. In 1863 he was made assistant observer at the Cambridge observatory, and in 1865 became director of that at Chicago. He became professor of astronomy at Williams college, 1876; built a meridian observatory there, has published a star catalogue, and a catalogue of right ascensions.

SAFFRON, a coloring material, consisting of the dried stigmas of the common yellow crocus, so abundant in our gardens in early spring. It was introduced into Europe from Asia Minor, and is largely cultivated in several countries, but chiefly in Spain. In England the crocus was unknown until 1339, when it was introduced from the east by a pilgrim; and in 1582 it was extensively cultivated for yielding saffron, especially in Essex, at the place now called in consequence Saffron-Walden. Its cultivation in Britain has almost entirely ceased, and the saffron used is imported. Saffron is not only valuable as a coloring material, but has from very early ages had a great medicinal reputation. Homer mentions it, and Solomon associates it with spikenard and other precious drugs and spices. A large portion of the supply in ancient times was yielded by Cashmere, where it is still extensively cultivated. In addition to its other properties, it is often used as a perfume, and in flavoring as well as coloring confectionery and other articles of food. These latter are now its chief uses in America, where its medicinal value has long been declining. The color yielded by saffron is a bright golden yellow, and is due to a peculiar principle called *polychroite*. Its great solubility in water prevents its being used as a dye for fabrics; but its agreeable flavor, and the absence of all injurious qualities, render it of great service in coloring articles of food.

The *S. crocus* (*crocus sativus*; see *CROCUS*) differs from most of the species of that genus in flowering in autumn, not in spring. It has large deep purple or violet flowers, with the throat bearded, and the long drooping trifid stigma much protruded from the tube of the perianth. The stigmas are the only valuable part of the plant.

In its cultivation the corms are planted in the beginning of summer in rows 6 in. apart, and 3 in. from bulb to bulb; the most suitable soil being a sandy loam, very thoroughly tilled. The stigmas are gathered by women and children, and are spread out on cloth or paper, and dried in the sun, or in kilns or drying-houses. The produce of an acre of saffron is about 5 pounds the first year, and 24 pounds the second and third year, after which the plantation must be renewed.

SAFFRON-WALDEN, a market t., parliamentary and municipal borough of England, in the county of Essex, 24 m. n.n.w. of Chelmsford. The church is an elegant specimen of late perpendicular. There is a museum, a library, and a training school for teachers. Agriculture is the principal industry. Pop. '91, 6104.

SAFVET PASHA, b. Constantinople, 1815; entered the diplomatic service, and was for a time secretary to the sultan Abdul Medjid. He was ambassador to Paris 1865-66, was member of the council of state, minister of foreign affairs, minister of justice, and for a short time in 1878 grand vizier. He d. in 1883.

SAGA, an old Norse word, used to denote a tale which, originally dependent on, and gradually elaborated by, oral tradition, had at last acquired a definite form in written literature. Such sagas (Norse *sögur*), along with poetical and legislative writings, constitute the chief part of the old Norwegian-Icelandic literature. They have been divided into historical and legendary. The latter embrace partly stories universally current

about heroes of the Teutonic race (e.g., the *Völsunga-Saga*), and partly stories peculiar to the Norse or Scandinavian peoples (e.g., the *Frithjofs-Saga*); while the former handle the events and personages of Norwegian and Icelandic history from the 9th to the 13th c., in numerous biographies and family records. To Danish history belong the *Knytlunga-Saga* and *Jomsrikinga-Saga*; to Swedish, the *Ingvars-Saga*; to Russian, the *Eymunds-Saga*. The Faröe islanders and the Orcadians have also their own sagas. After the middle of the 14th c., when the motley literature of the church began to exercise an influence, tales were translated from foreign languages into Norse, e.g., the story of *Barlaam and Josaphat* (q.v.), which also received the name of sagas. Bishop P. E. Müller, in his *Sagabibliothek* (Copenh. 1817-20) was the first who subjected the whole subject of saga-literature to a critical treatment. Since his time collections both of the historical and legendary sagas, with critical apparatus more or less complete, have appeared in all the countries of the north. The German *sage* is the same word, and expresses fundamentally the same idea as the Norse *saga*.

SAGADAHOC, a co. in s. Maine drained by the Androscoggin and the Kennebec rivers; area, 260 sq. m.; pop. '90, 19,452. Co. seat, Bath.

SAGAN, a t. of Prussia, prov. of Silesia, 82 m. n.w. of Breslau, on the Bober. Pop. '95, 13,183, who manufacture cotton and woolen cloths and paper, and trade in yarn, cattle, and corn. It formerly belonged to Wallenstein.

SAGASTA, PRAXEDES MATEO, Spanish statesman, was born at Torrecilla de Cameros, July 21, 1827. He studied in the School of Engineers at Madrid, followed his profession at Valladolid and Zamora, and was elected by the latter town to the Constituent Cortes of 1854. For his part in the insurrection of 1856 he was forced to seek refuge in France. After the amnesty he returned to Spain, and became a professor in the School of Engineers, and editor of *La Iberia*, the principal Progressist organ. After the insurrection of 1866 he again fled to France, remaining until the fall of Queen Isabella II. He was made Minister of the Interior in the first cabinet formed by General Prim, and Minister of State in 1870, which positions he continued to hold in the first cabinet of King Amadeus. Under the presidency of Marshal Serrano, in 1874, he was Minister for Foreign Affairs (Jan. 4), Minister of the Interior (May 13) and President of the Council (Aug. 4). In June, 1875, he gave in his adherence to Alfonso XII. and endeavored to form a Liberal Constitutional party, but subsequently joined the opposition. When a new Liberal party was formed in 1880, he gave in his adhesion to it. Early in 1881 a coalition between Sagasta and Martinez Campos came into power, which lasted until October, 1883, and was shortly followed by the return of the Conservatives to power. On the death of Alfonso XII. (1885), Sagasta came back and became head of the government, which position he retained until 1890. He was again premier in 1892-95, and in 1897, after the death of Canovas.

SAGE, RUSSELL, an American financier; was b. in Oneida co., N. Y., Aug. 4, 1816. From 1841-1848 he was an alderman of Troy, N. Y. He was a member of Congress, 1853-57. He later settled in New York city, and became associated with Jay Gould in the management of many railroads and other corporations. In Dec., 1891, he was attacked in his office, and narrowly escaped death from the explosion of a bomb. His assailant was killed, but one of Sage's employees was seriously injured and brought suit for heavy damages, securing a judgment in 1894. Sage appealed from this judgment, but it was affirmed by the Supreme Court in 1896.

SAGE, *Salvia*, a genus of plants of the natural order *labiatæ*, and containing many species, herbaceous, and half-shrubby. There are only two perfect stamens, the filaments of which bear at their summit a cross thread—the much elongated *connective*—fastened by a joint, and having one cell of the anther at the upper end, and the other but imperfect cell at the other end.—COMMON SAGE, or GARDEN SAGE (*S. officinalis*), grows on sunny mountain slopes and rocks in the s. of Europe, and has long been in general cultivation in gardens. It is a half-shrubby plant, seldom more than two ft. high, with ovate-oblong or lanceolate, finely notched, curiously wrinkled, whitish-gray leaves, and racemes of purplish-blue, rarely white or red flowers. The whole plant has a peculiar, strong, penetrating aromatic smell, somewhat resembling that of camphor, and a bitterish, aromatic, somewhat astringent taste. It contains much essential oil (*oil of sage*). *Sage leaves* are much used in flavoring dishes, and in sauces, etc. The leaves and young shoots are used for astringent tonic gargles. *Sage tea*, made of the dried leaves and shoots, is a popular astringent and tonic. Sage grows best in a dry soil, and is easily propagated by slips or cuttings.—CLARY is a species of sage.—MEADOW CLARY, or MEADOW SAGE (*S. pratensis*), is a common ornament of meadows and borders of fields in most parts of the continent of Europe, and in the s. of England. It has bluish-purple flowers. It is sometimes fraudulently put into beer, to make it more intoxicating.—THE APPLE-BEARING SAGE (*S. pomifera*) is a native of the s. of Europe and of the east, remarkable for its very large reddish or purple bracts, and for the large gall-nuts which grow on its branches, as on the leaves of the oak, and which are known as *sage apples*.

SAGE-BRUSH, a popular name for the *artemisia tridentata*, and other artemisias of the western table-lands and plains. One kind, called the white sage, is much liked by cattle and affords good pasture.

SAGE-BRUSH STATE. See STATES, POPULAR NAMES OF.

SAGE-CKOCK. See COCK OF THE PLAINS.

SAGHALI'EN, spelled in all Russian accounts Sakhalin (q.v.).

SAG HARBOR, a village in Suffolk co., N. Y.; on Long Island, Gardiner's bay, and the Long Island railroad; 100 miles e. of New York. It has a fine harbor, large public school, public library, a bridge connecting with North Haven, banks, several churches, weekly newspapers, waterworks, and manufactories of watch cases, silver ware, and edge tools. It was formerly a noted whaling port, but is now chiefly a place of summer residence, with many local attractions. Pop. '90, not fully reported.

SAGINAW, a co. in the center of the lower peninsula of Michigan; drained by the Saginaw, the Cass, the Flint, the Shiawassee, and the Tittabawassee rivers; on the Michigan Central, the Flint and Père Marquette, and several other important railroads; about 816 sq. m.; pop. '90, 82,273. Co. seat, Saginaw.

SAGINAW, city and co. seat of Saginaw co., Mich.; on the Saginaw river and the Cincinnati, Saginaw, and Mackinaw, the Detroit, Lansing, and Northern, the Flint and Père Marquette, the Michigan Central, and the Saginaw, Tuscola, and Huron railroads; 64 miles n.e. of Lansing. It contains the East Side and West Side high schools, St. Andrew's academy (R. C.), German Lutheran seminary, a medical college, public school property valued at about \$700,000, and the public, Hoyt public, Teutonia, school district, and seminary libraries. There are the Saginaw, St. Mary's and Woman's hospitals, waterworks on the direct pressure system, electric street railroads, electric lights, national and state banks, daily and weekly newspapers, and nearly 50 churches. The city occupies a plain, 30 feet above the river, and, since the consolidation of 1890, includes the former city of East Saginaw, on the opposite side of the river, which is here spanned by several bridges. In 1890 the U. S. census reported for Saginaw, 335 manufacturing establishments, employing \$12,406,823 capital and 5,716 persons, paying \$2,653,135 for wages and \$6,587,763 for materials, and having a combined output valued at \$11,303,006. The principal plants are lumber and planing mills, foundries, and machine shops, salt works, and flour and grist mills. Pop. '90, 46,322.

SAGINAW BAY, an arm of Lake Huron, extends s.w. and forms an indentation of the shore of the state of Michigan. It has several fine harbors and picturesque islands. The Saginaw river flows into it.

SAGO is a nutritive substance obtained from several species of palms, especially the *metrozylon sago*, which abounds in Ceram and the west coast of New Guinea. It grows also in Sumatra, Borneo, Celebes, Timor, Buro, and other islands of the Indian archipelago. In many of the islands sago is the chief article of food, and by the Alfoers and Papuans is made either into a gruel or baked into cakes. The sago-tree is first a shrub with several upright green branches, which at their lower parts are covered with thorns. After three years these branches form one stem, and the thorns gradually disappear. The tree attains a height of from 40 to 60 ft., and within the ligneous bark it is filled with fibers and flour. It first blooms when 10 to 15 years old, according to the nature of the soil, flourishing best in a moist situation. After blooming, the flour transpires through the pores of the leaves, indicating that the tree is ripe. It must then be cut down within a year, or the flour will be lost. The stem is cut into lengths, split open, and the pith dug out and placed in a vessel with a sieve bottom. Water is applied to separate the flour and carry it into a second vessel, where it is soon deposited. The water is then run off, and the flour dried and put into little baskets made of sago-leaves. The produce of a tree averages 750 lbs. A large quantity of sago-flour is annually sent from the n.w. of Borneo, the n.e. of Sumatra, and Siak, to Singapore, the leading market, where it is purified and fitted for use as starch in the calico and other manufactures. In Borneo much of the sago is granulated; and the Chinese of Malacca prepare pearl-sago, which is also sent to Singapore. Pearl-sago is in small pearly-white spherical grains, varying in size from that of a poppy-seed to a grain of millet. Granulated sago is also in round grains, but of a larger size. There are several varieties, which differ much in color, some being white and others reddish-brown, like radish-seed. One kind of granulated sago from India has been introduced under the name of tapioca.

SAGUACHE, a co. in s. Colorado; drained by Saguache creek, Gunnison river, Los Pinos creek, and other small streams; 3240 sq. m.; pop. '90, 3313. Its surface is mountainous; in the n.e. is Homan's park. Co. seat, Saguache.

SAGUA-LA-GRANDE, a commune of Cuba, on the river Sagua, about 152 m. s.e. from Havana. It is of considerable importance, and is connected by railway with Villa Clara and other places. It has a lighthouse. Pop. '87, 18,330.

SAGUENAY, a large river of Canada, falling into the estuary of the St. Lawrence, on the n. side, about 115 m. below Quebec. It drains the lake of St. John, which is nearly circular, and almost 30 m. in diameter. Its course from that lake to the gulf of St. Lawrence is about 100 m., and is almost a straight line. It flows between precipitous cliffs, has numerous cataracts in its upper part, and is in many places two or three m. broad. In the lower part of its course it is less wide, but very deep, and large ships ascend it more than 60 m. to load with timber from the settlements on its banks. The name Saguenay is sometimes also given to the principal river which falls into lake St. John, and which is known to the Indians as the Chomouchouan and as the Assouap-

moussouin. It rises about 200 m. to the w. of lake St. John. The average depth in mid-channel is 145 fathoms.

SAGUENAY, a co. in n.e. Quebec, having the St. Lawrence river for its s. and s.e. boundary; drained by Murray and Black rivers, and the head waters of the Little Saguenay; 12,815 sq. m.; pop. '91, 9555. It includes the island of Anticosti, a resort for seal and bear hunting and salmon fishing, also lakes St. John and St. Anne. The principal towns are on the coast; and fishing is the chief industry. It has saw and grist mills, and a large lumber trade. Co. seat, Tadoussac.

SAGUNTUM, a wealthy and warlike town of ancient Spain, in Hispania Tarraconensis, stood on an eminence near the mouth of the Pallantias (modern Palancia). Its site is now occupied by the town of Murviedro (q.v.). Founded (according to Strabo) by Greeks from Zacynthus, it became at an early period celebrated for its commerce, and attained to great wealth. But it owes its historical vitality to the circumstances of its siege and destruction by the Carthaginians, under Hannibal, in 219 B.C. Having withstood the siege for the greater part of a year, against an army amounting to about 150,000 men, led by a general of consummate ability and indomitable resolution, the Saguntines, now most severely pressed by famine, concluded, with an act of heroic defiance and self-sacrifice, a resistance that had been characterized by the most brilliant valor. Heaping their valuable effects into one vast pile, and placing their women and children around it, the men issued forth for the last time against the enemy; and the women setting fire to the pile they had prepared, cast themselves upon it, with their children, and found in flames the fate their husbands met in battle. The destruction of Saguntum directly led to the second Punic war.

SAHAP'TINS, or **SAPTINS**, a family of Indians w. of the Rocky mountains, occupying the country on both sides of the Columbia river, and on the forks of the Lewis and Sahaptin or Snake rivers. They are mostly in Oregon, Idaho, and Washington territories. They comprise the Nez Percés, Palus Tairtlas, Wasco, Wallawallas, Yakimas, and Kliketats.

SAHARA. The immense tract of country to which this name is commonly given has already been described under the heading **AFRICA** (q.v.). But the term Sahara is more correctly applied to a region of much more limited extent. The natives divide Africa n. of the line into three portions—the Tell, the Sahara, and the Desert. The Tell extends from the Mediterranean to the Atlas mountains; the Sahara, from the Atlas to the southern region where all regular supply of water fails; and the Desert, from the southern and not very clearly-defined frontier of the Sahara, southward almost to the watershed of the Niger, comprising a district salt and arid, inhospitable to man and beast, although the camel may even here snatch a scanty subsistence. As to physical geography, the Sahara may be subdivided into the following districts—1. The Hauts Plateaux, or Steppes, a series of high levels skirting the base of the Atlas mountains. 2. The land of the Dayats or waterless oases, stretching s. to the high lands on the s. bank of the Wed Mzi or Djidi. 3. The region of the southern oases, to the s. of the former, and extending s. till it loses itself in the desert. The idea of flooding the natural depression in the western S. has been proposed by Donald Mackenzie as a commercial water-way to the interior; the French government in 1880 had a party exploring a route for a trans-Saharan railway to unite Algiers with the Senegal and Niger region. The pop. of S. is estimated at about 2,500,000. See H. B. Tristram's *Great Sahara*; Nachtigal's *Sahara and Sudan* (1879); and Schirmer's *Le Sahara* (1893).

SAHARANPUR or **SUHURNPUR**, a city of British India, North-West Provinces, the capital of a district of the same name. It is situated in a plain 95 m. n.e. of Delhi, and about one mile e. of the Doab canal. It has a large fort, a military cantonment, and a government depot, a mosque and an American mission. Saharanpur is about 1000 ft. above the sea, and the climate is temperate during great part of the year. Pop. '91, 63,194.

SAIDA. See **SIDON**.

SAID PASHA, MEHMEMED, a Turkish statesman, born in Constantinople in 1835, took part in the pacification of Syria in 1860. After the Russo-Turkish war of 1877-8 he was made secretary of state and member of the reform commission by Abdul Hamid II. In 1879 he was made prime minister, but removed the following year. He was grand vizier from 1882 to 1885, and again for a few months in 1895, when his position became so dangerous that he fled to the English embassy for safety. He belongs to the party which seeks reform without the intervention of foreign nations.

SAIGA. See **ANTELOPE**.

SAIGO, the family name of two brothers, both of whom have held the highest military office in Japan. S. TAKAMORI, b. in Satsuma about 1827, a man of commanding physical and intellectual superiority, was one of the early supporters of the literary and political revolution that broke up anarchy in Japan and established the present monarchy, which is but the ancient system restored. He was three times arrested and banished by the Yedo government of the tycoon; and in 1868 commanded the mikado's

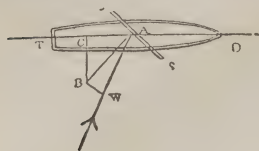
forces and put down the rebels on the main island and in Yezo after a war of nearly two years. Being made marshal of the imperial army in 1873, he resigned after a few months, in consequence of a disagreement with the cabinet on the question of going to war with Corea. He retired to Satsuma and began the establishment of "military schools." On Feb. 1, 1877, the great "Satsuma rebellion," led by him and into which circumstances forced him prematurely, began by the seizure of vessels at Kagoshima laden with powder belonging to the government. To suppress the rebel forces, who were led and animated by his high military genius, the imperial government sent over 60,000 men into the field for eight months. After many bloody battles, and the loss of nearly ten thousand in killed and wounded on each side, the rebellion was ended by the battle of Shiroyama, in which the little band of four hundred rebels, armed only with swords and led by Saigo, Kirino, and Murata, were surrounded by 15,000 imperial troops. All of the band were killed or committed *hara-kiri*. SAIGO the younger, or Saigo Yori-michi, b. in 1843 in Satsuma, was also conspicuous in the restoration of 1868. In 1874 he led the Japanese expedition to Formosa, occupying the aboriginal portion of the island with 1300 troops for six months, and severely chastising the cannibals in several skirmishes. In 1876, as president of the Japanese commission at the centennial exposition at Philadelphia, he spent several months in the United States. In 1877, though not ordered to do so by the mikado, he took the field against the Satsuma rebels, and led the operations that closed the campaign. He was war minister 1879-80, was appointed chief of the colonial office in 1882, and later held the office of minister of marine.

SAIGON, one of the finest river-ports in Asia, the capital of the French possessions in Lower Cochinchina, stands on a small river of the same name, about 34 m. from the Chinese sea. The city is fortified, and its value as a strategical position is unquestionable. By land it is defended from attack by many miles of jungle and swamp, and the approach from the sea on the s., by the fine river Donnai, could easily be rendered impassable to the strongest fleet. The entrance to the Donnai is at cape St. Jacques, and its winding course to Saigon, through a rich level country, is from 50 to 60 m. in length, and might be defended by fortifications at every point. It is of easy navigation, and is of sufficient depth to allow vessels of the heaviest burden to sail close to its banks under the overhanging foliage. The breadth of the river from Saigon to the sea varies little, but it is never narrower than the Thames at London. It is joined on both sides by many large affluents, and it is the main channel of a river-system that covers the whole country to the s. of the capital with a network of water-courses. The city of Saigon is fortified, and is defended by a permanent force of 1200 men. At the beginning of the year 1865 the law of conscription, by which one man in seven is chosen from among the natives for military service, was already in force. Saigon consists of two parts, the Chinese town, 4 m. inland, filled with an active population busily engaged in trade, and the European, or fortified town on the banks of the Saigon. The latter, with its fleet of vessels riding at anchor in midstream, is already of considerable size. Good roads have been constructed for many miles around, and there are barracks, hospitals, official residences, and other buildings for public purposes. The soil is abundantly fertile, and is admirably suited to the production of cotton, sugar, indigo, and tobacco, besides rice, the principal export. Its forests contain magnificent timber, and abound in woods rich in dyes. Many handsome public buildings have been erected. Besides the palace of the governor-general, there are the palace of justice, hospitals, mission buildings, a cathedral, mosques, a museum, zoological and botanical garden, observatory, theater, prison, theological seminary and other institutions for higher education. There is a naval yard and arsenal, and shipbuilding is carried on. It is an important commercial center and has a chamber of commerce. The exports consist chiefly of rice; the imports include a great variety of manufactures, machines, petroleum, chemicals, etc. In 1895, 494 vessels of 620,116 tons entered the port. Pop. '90, 16,213; of business suburb of Cholon, 39,925.

Saigon, together with part of the territory of which it is the capital, was taken by the French in 1860. Treaties of peace and commerce, concluded with the Anamite government in 1864, provided that the protectorate of the six provinces of Lower Cochinchina should remain in the hands of France; that three important ports on the coast of Anam should be opened; and that a space of 9 kilometers on the shore of each port should be conceded to the French for the establishment of factories; that French merchants and missionaries should be allowed to traverse the kingdom of Anam without hindrance, and that an indemnity of 100 millions of francs should be paid. In 1867, in consequence of fresh aggressions, encouraged by the government of Anam, the French took the town of Vinh-long, and, by a new treaty, added three other provinces to their dominions. The imports in 1895 amounted to \$14,284,443; the exports to \$13,992,546. In the budget of 1896 the revenue and expenditure were 3,109,201 francs.

SAIL. A sail is an expanse of canvas, matting, or other strong material, on which the wind may exert its force and propel the vessel. A sail is extended by means of a mast or yard, or both. It may be of various shapes, and of any size, according to the carrying power of the vessel. A vessel of shallow draught or of narrow beam can bear comparatively little sail; while a vessel of proportionately deep draught and heavily ballasted—as a yacht—or a vessel of great breadth of beam, can carry sail of great area. A sail acts with the greatest power when the wind is directly astern; but it can be applied, though with less strength, when on either beam. The action of the wind on an oblique sail is a good example of the resolution of forces. See COMPOSITION AND RESOLUTION OF FORCES, etc. Let TD, in the fig., be a ship, PAS its sail, WA the direction

of the wind, and let the length of WA represent the pressure of the wind on the sail.



WA can be resolved into AB perpendicular to the sail, and BW parallel to it, the latter of which has no effect in pressing on the sail; therefore AB is the effective pressure on the sail. Were the vessel round, it would move in the direction BA. Let BA be resolved into CA and BC, the former, CA, acting in the direction of the keel or length of the vessel, or in the direction CAD, and the latter perpendicular to it, or in the direction of the breadth. The former pressure, CA, is the only pressure that moves the vessel forward, the other, BC, makes it move sideways.

From the form of the vessel, however, this latter force, BC, produces comparatively little lateral motion; any that it does occasion is called *leeway*. It results, therefore, that with the wind exerting an oblique pressure, the actual progress will be to the power of the wind only as CA to WA. In the east and the Mediterranean, sails are frequently made of strong matting; but among northern nations, and for ocean navigation, very strong cloth, or canvas, called *sail-cloth*, is usually resorted to. It is woven narrow; and the many breadths in the sail are joined by carefully made double seams.

Sails are nearly always either triangular or quadrilateral, but not necessarily equiangular. To give greater strength, a strong rope or cord is sewn into the outer edge all round the sail; this rope has eyes in it, to which the various ropes employed in connection with the sail are fastened. The top of a sail is its *head*; the bottom, its *foot*; and the sides are *leeches*; the upper corners are termed *ear-rings*; the lower corners of a square sail, and the after lower corner of other sails, *clews*; the front lower corner of a fore-and-aft sail is the *tack*. The ropes from the lower corners, used in tightening the sail against the wind, are the *sheets*.

The sails of a ship are either "square" or "fore-and-aft." The square-sails—beginning from below—are the *course*, the *topsail*, the *topgallant-sail*, the *royal*, and, though very rarely used, the *sky-scraper*. Each has the name of the mast on which it is set prefixed, as "fore-topsail," "main-royal," etc. The square-sails are made fast by their heads to yards, the foot being drawn to the extremity of the yard below. Fore-and-aft sails are the *spanker* or *driver*, extended by the gaff at its head, boom at its foot, and mast on its fore-leech; the *staysails*, which are suspended by rings to the stays, and the *jibs* (q. v.). In a three-masted vessel the sails of most importance are the main-course, the spanker, the topsails, the fore-staysail, and the jibs, which can usually be all distended to the full without taking wind from each other. In very light winds, when every breath is of consequence, the area of the sails is increased by setting the *studding-sails*, which are oblong sails set on each side of the square-sails, on short booms run out beyond the yards of the latter.

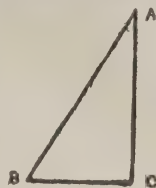
In small craft and boats, the most common sail is a lugsail (see LUGGER), which is a small square-sail, occasionally supplemented by a shoulder-of-mutton (triangular) sail on a shorter mast at the stern. Cutters or sloops carry a large spanker, with a topsail of similar shape, and jibs; some having the power of setting a large course when the wind is astern; but it is obvious that the course and spanker cannot be used together. A schooner uses the same sails as a cutter, except that in one form she carries a square topsail and topgallant-sail on the foremast.

Sails are furnished with rows of short ropes for the purpose of *reefing* them, when their area is too large for the wind. The effect of a sail is increased by wetting it, as the pores of the canvas close more tightly through the swelling of the hemp.

SAIL-CLOTH, a very strong fabric, woven generally with linen yarn, but in America it has been made wholly of cotton; and in Gt. Britain, under Armitage's patent, of cotton and linen mixed. Hair—such as of the ox, horse, and deer—has also been used, under Taylor's patent, in 1832, but without success. Linen and hempen cloths are those generally used in all parts of Europe.

SAILINGS, the technical name in navigation for the various modes of determining the amount or direction of a ship's motion, or her position after having sailed a given distance in a given direction. The direction of a ship's motion is her *course*, and is expressed in terms of the angle between the line of direction and the meridian; the length of her path is the *distance*; the distance in nautical miles, made good to the e. or w., is the *departure*, and is measured along a parallel; the *difference of latitude* is an arc of the meridian intercepted by the parallels, one of which passes through the place sailed from, the other through the place sailed to; and the *difference of longitude* is an arc of the equator intercepted by meridians through the same two places. It will at once be seen that if a ship sails along a meridian, the difference of latitude becomes the course, and there is no departure or difference of longitude; and that if it sails along a parallel the departure will be the same as the distance, and there will be no difference of latitude. The two general questions which present themselves to the navigator for solution are—1. Given the course and distance from one place in given latitude and longitude to another place, find the latitude and longitude of the other; and 2. Given the latitude and longitude of two places, find the course and distance from the one to the other. The simplest way in which such problems can be solved is by the method known as *plane sailing*, a

method, however, which is only roughly approximate, assuming, as it does, that the surface of the sea is a plane; it is consequently applicable only to short distances and low latitudes where the meridians are nearly parallel. According to "plane sailing," the elements of a ship's path are represented by a right-angled plane triangle, as ABC (fig.), where AB is the distance, the angle BAC the course, AC the difference of latitude (AC being a portion of a meridian, and BC of a parallel of latitude), and BC the departure. The two problems given above are in this method merely simple cases of the resolution of a right-angled plane triangle (see TRIGONOMETRY), for if the course and distance are given, the *diff. of lat.* = distance \times cos. of course, and *dep.* = dist. \times sin. of course; while the idea of *diff. of long.*, as distinct from *dep.*, is quite inadmissible, since the method presupposes that the ship is sailing on an absolutely flat plain. If the ship does not stand on one course, but changes from time to time, the calculation of her final position may be effected, either by the previous method, repeated for each change of course, or more conveniently, by the method of *traverse sailing*. This method consists in the resolution of a ship's course and distance into two courses and distances, the courses being in the direction of some of the four cardinal points of the compass; thus, a ship which has sailed s.w.-by-s. for 24 m., has made 20 m. of *southing*, and 13.3 m. of *westing*. The *traverse table* has consequently six columns, the first containing the courses; the second, the corresponding distances; while the third and fourth contain the difference of latitude for each course, which, if n., is put in one column, and if s. into the other; the fifth and sixth columns, marked respectively e. and w., contain in a similar manner the departure for each course. When the table has been made out for the various courses and distances, the columns of *diff. of lat.* and departure are summed up, and the difference between the third and fourth, and between the fifth and sixth columns, gives the *diff. of lat.* and departure between the place sailed from and the place arrived at, from which the course and distance made good can be calculated as before. When a current interferes in any way, either by accelerating or retarding the ship's motion, its effect is estimated as in *traverse sailing*, as if it were one course and distance, the *set* of the current being the course, and its *drift*, i.e., its rate per hour multiplied by the number of hours it has affected the ship, the distance.



Parallel sailing may be employed when a ship sails between two places, on the same parallel of latitude, in which case, if her head be kept accurately and constantly in an e. or w. direction, she will describe an arc of the parallel between the two places. As in this sailing the departure is the same arc of the parallel that the difference of longitude is of the equator, the *dep.* (which is now the *distance*) = *diff. of long.* \times cos. of *lat.* The other elements are found as in plane sailing.

Middle latitude sailing is the application of the principle of parallel sailing to the case in which the ship's course is not perpendicular but oblique to the meridian; it is merely an approximate method, coming very close to a true estimate in low latitudes for any course, and in all latitudes for a course nearly e. and w. (i.e., one in which the distance is large as compared with the difference of latitude), but erring widely under other circumstances, though errors may be diminished as much as we please by dividing the distance into portions, and calculating the *diff. of long.* for each. The object of this sailing is to deduce the *diff. of long.* from the *dep.*, and *vice versa*, on the supposition that the whole departure has been made good along the parallel of latitude which is equidistant from each extremity of the course, a method which, at first sight, would seem to give a correct result, and would do so if the parallels of latitude increased uniformly, which they do not. The *dep.*, when laid off along the parallel of middle latitude, always gives the *diff. of long.* too small, and hence the limitations above noticed. When the latitudes are of the same name, the middle latitude is half their sum; but when of contrary names, it is better to find the *diff. of long.* for the portion on each side of the equator separately, the two middle latitudes being respectively half the latitude of the place sailed from, and half that of the place sailed to. The formulas are the same as for parallel sailing and plane sailing.

Mercator's sailing is a perfect method of obtaining the same result as is found approximately by middle latitude sailing, but in the former case the *diff. of long.* is found from the departure, while in this method the difference of latitude is employed for the same purpose. A table of meridional parts, as it is called, is necessary; this table shows the number of minutes in Mercator's projection (see MAP) corresponding to each degree and minute of latitude up to 78°, and is employed as follows. The latitude sailed from, and that reached, being known or found, the meridional parts for each are obtained, and their difference, if the latitudes are of the same name, or sum if of opposite names, gives the *diff. of lat.* We have then a right-angled triangle, with the *diff. of lat.* and *diff. of long.* forming the two smaller sides, and the vertical angle representing the course, whence *diff. of long.* = *diff. of lat.* \times tan. of *course*. This sailing is the one most generally employed by navigators, but is inferior in practice to middle-latitude sailing, in the cases noticed under that head, for though it be a perfect, and the other merely an approximate method, yet a small error in the course (if large), or in the *diff. of lat.*, becomes greatly magnified in the *diff. of long.*; while in the case of the latter, a considerable error in departure is hardly magnified, and a large error in the course (if nearly e. and w.) becomes imper-

ceptible in the dif. of long. It is, however, better to work the problem according to both methods, and then estimate the true result as nearly as possible.

Great circle sailing (q.v.), the most perfect of all methods for finding a ship's course, is separately noticed. See also SPHEROGRAPH.

The obstacles that interfere with the correctness of the mariner's calculations are chiefly those which affect his data, the course and distance, the more important being the magnetic deviation of the compass produced by the attraction of the ship, errors in the estimated leeway or in the set and drift of currents, etc.; all of which require to be taken into account. The necessity for frequently checking the *dead-reckoning* (q.v.), by means of astronomical observations, is sufficiently apparent.

SAIMIRI. See SAPAJO.

SAIN FOIN, or SAINTFOIN, *Onobrychis sativa*, a plant of the natural order *leguminosæ*, suborder *papilionaceæ*, of a genus nearly allied to *hedysarum*, but having one-seeded pods, which are marked with wrinkles or pits, and are more or less prickly-toothed at the margin. It is a spreading perennial, about 2 or 3 ft. high, with leaves of 9 to 15 smooth acute leaflets, and spikes of beautiful flesh-colored flowers, striated with rose-red, on long stalks. It is a native of the continent of Europe and of the s. of England, and is much cultivated as a fodder-plant in dry and particularly in calcareous soils, to which it is admirably adapted. Its cultivation was introduced into England in 1651; and before the introduction of turnip-husbandry, the sheep-farmers of the chalk districts depended almost entirely upon it, as they still do to such a degree that in many leases there is a stipulation for the tenant's leaving a certain extent of land in sainfoin. It is, however, a very local crop, being scarcely cultivated on any but the most calcareous soils, where nothing else is nearly equal to it, although it has been found to succeed well on any soil sufficiently dry. There is no more nutritious fodder than sainfoin, whether for sheep, oxen, or horses. Even the dry stems of a crop which has produced seed are readily consumed by cattle, if cut into small pieces. Sainfoin sometimes endures for 10, or even 15 years on the same land—more generally only for 4 to 7 years; and in the eastern counties of England it is often sown instead of clover on light and somewhat calcareous sands and sandy loams, and the ground is plowed again in two or three years.—The name sainfoin is perhaps rather *sang-foin*, from the blood-color of the flowers, than *saint-foin* (holy hay).

SAINT AFFRIQUE. See AFFRIQUE, SAINT.

SAINT ALBAN HALL, Oxford, takes its name from Robert de St. Alban, a citizen of Oxford, who conveyed the building to the nuns of Littlemore, near Oxford, in 1230. On the dissolution of the nunnery, it was given by king Henry VIII. to his physician, George Owen, D.M., who conveyed it to lord Williams of Thame, and sir John Gresham. By their assignees, it was finally transferred to the warden and fellows of Merton college, and was some time after established as an academical hall. The principal of this, as well as of the other four halls, is assisted in his duties by a vice-principal and other officers appointed by himself.

SAINT ALBANS. See ALBANS, SAINT. (Other names beginning with *Saint*, and not given under that word, will similarly be found under the other part of the name.)

SAINT ALBANS, city and co. seat of Franklin co., Vt.; on the Central Vermont railroad; 3 miles from lake Champlain, 70 miles s. of Montreal. On elevated ground, in the midst of a fertile agricultural region, the scenery is diversified from neighboring hills; extensive views of the Green and Adirondack mountains and lake Champlain may be obtained. It has several sulphur springs, and is frequented as an agreeable summer resort. In the vicinity are quarries of calico stone and variegated marble; most of the surrounding country is devoted to the products of the dairy, many thousand pounds of butter and cheese being annually shipped to Boston and other places. There are the St. Albans academy, graded schools, Warner hospital, Warner home for little wanderers, Young Men's gymnasium and reading-room, offices, shops, and library of the Central Vermont railroad, Vila Barlow convent, Franklin library, Taylor park, Aldis and Bellevue hills, electric lights, national and state banks, one of the largest creameries in the world, and daily, weekly, and monthly periodicals. St. Albans was raided by confederates from Canada, 1864; was a Fenian headquarters, 1866; and was made a city, 1897. Pop. '90, 7771.

SAINT ALBANS, HARRIET MELLON, Duchess of, 1775–1837. She was a successful actress in comedy, who married Mr. Coutts, a London banker; at his death she inherited a great estate. In 1827 she married the duke of St. Albans, to whom, at her death, she bequeathed £10,000 yearly, with a life estate in a portion of her landed property; but most of her property was left to the granddaughter of her first husband, the present baroness Burdett-Coutts.

SAINT AMAND-LES-EAUX, a small town of France in the dep. of Nord, 8 m. n.n.w. of Valenciennes. The town contains hot sulphur springs; and iron and steel are manufactured. Pop. '91, 8703; commune, 12,043.

SAINT AMAND-MONTROND, a t. of France in the dep. of Cher, stands on the right bank of the river of that name, 25 m. s.s.e. of Bourges. Pop. '91, 7895; commune, 8673.

SAINT ANDREWS. See ANDREWS, ST.

SAINT ANDREWS, town, port of entry, and co. seat of Charlotte co., New Brunswick, on Passamaquoddy bay and the Canadian Pacific railroad; 60 miles w. by s. of St. John. It is on a narrow strip of land facing the sea; has a deep harbor entered by two passes; and is a popular sea-bathing and summer resort. There are co. buildings, custom-house, marine hospital, iron foundry, many large hotels, and large fishing, lumbering, and shipbuilding interests. The harbor is free from ice in winter and safe throughout the year. Pop. '91, 1,800.

SAINT ANTHONY, MINN. See MINNEAPOLIS.

SAINT ANTHONY'S FIRE. See ANTONY, St.

SAINT ARNAUD. See LEROY DE SAINT-ARNAUD.

SAINT AUGUSTINE, city, port of entry, and co. seat of St. John's co., Fla.; on the Matanzas river near the Atlantic ocean, and the Florida East Coast and the St. Augustine and South Beach railroads; 36 m. s. of Jacksonville. It has a flat, sandy site on a peninsula formed by the Matanzas and St. Sebastian rivers, with Anastasia island directly in front. As early as 1512, Ponce de Leon, the Spaniard in search of the "Fountain of Youth," landed near the site of St. Augustine, and half a century later, 1564, some French Huguenots also attempted a settlement, but migrated to St. John's river. Don Pedro Menendez de Avilio was sent out by Philip II. of Spain to exterminate the trespassers, and he landed on August 28th, 1565, San Augustine's day, at this point, and erected a fort, a circumstance that entitles the city to boast of being the earliest settlement in the United States. The place was defended with difficulty against the Indians and French adventurers; was captured and pillaged by Sir Francis Drake in 1586, by pirates in 1665, and was assaulted by forces from the Carolinas. In 1763 St. Augustine passed into the hands of the British, and became an important military depot during the Revolution. It was restored to Spain ten years later, and in 1821 was ceded to the United States. During the civil war it was twice captured by the federalists. The quaint beauty of this old Spanish town, with its ruined gates and castle, its narrow lanes and overhanging balconies, its delightful climate, attracts many visitors during the winter, when its population more than doubles. The country in the immediate neighborhood is uninteresting, but the gardens and squares are overgrown with magnolias and bananas, orange and citron trees, date-palms and palmettos. The climate is noticeably even and healthy, except near the marshes. The heat of the summer is tempered by sea-breezes and the Gulf winds, and the winters are like the Indian summers of the North. The mean temperature is about 70° for the year, 58° for winter. The city contains U. S. barracks, Wilson public library, Memorial Presbyterian church, old Catholic cathedral, Spanish and confederate memorial monuments, convents of St. Mary and the Sisters of St. Joseph, U. S. post office on the site of the Spanish governor's palace, the state institute for the blind, deaf, and dumb, separate graded schools for white and colored pupils, and a national bank. The city, widely noted as a winter residence and health resort, has several of the most magnificent hotels in the world, notably the Ponce de Leon, the Alcazar, the Cordova with its great sun parlor, and, beyond the city gate, the San Marco. The principal industry is the manufacture of cigars. "One of the most interesting streets in the city is St. George, leading to the remains of the old city gate, which dates from the Spanish foundation, although the exact period is not known. To the left is the old Huguenot graveyard. The graves of Major Dade's command and other soldiers are in the military cemetery. Fort Marion is an interesting relic. A sea-wall along the front is used for a promenade. Pop. '90, 4,742.

SAINT AUSTELL, a parl. and market t. of Cornwall, 29 m. w. of Plymouth. Some goods are manufactured, and at the bay of Saint Austell, about a mile distant, there is a pilchard-fishery, and tin and copper are exported, and some china stone is quarried. Pop. '91, 3477.

SAINT BARTHOLOMEW, island. See BARTHOLOMEW, St.

SAINT BEES, an ancient village and parish of Cumberland, pleasantly situated on the bay formed by *St. Bees Head*. It is 4 m. s. of Whitehaven, and about 10 m. beyond the limits of the lake district. Saint Bees is a station on the Furness railway. The parish is very large, comprising town and port of Whitehaven, village of St. Bees, and several chapelries and townships. The village of St. Bees contained, '91, 1041 inhabitants. According to tradition preserved by the early chroniclers, Saint Bees originated in a nunnery founded here, 650 A. D., by an Irish saint named Bega, of whom Sandford's MS. (in the Dean and Chapter library, Carlisle) records a very pretty legend. It appears to have been destroyed before the reign of Henry I., in whose time we find that Ranulph, earl of Cumberland, reconstituted it as a priory; but after the dissolution of the monasteries it went to ruin. The institution known as SAINT BEES COLLEGE was established in 1816 by Dr. Law, then bishop of Chester, to supply a systematic training in divinity to young men desirous of ordination, whose means were inadequate to defray the expenses of a university education. The bishops of the province of York had previously been compelled to ordain a number of such men as literates, the poverty of many of the northern benefices not securing a sufficient supply of graduates. A portion of the ruined priory of Saint Bees was fitted up by the earl of Lonsdale as lecture-rooms, library, etc. On the recommendation of the bishop, an incumbent was selected

for the perpetual curacy of Saint Bees (value, £100 per annum) by the patron, the earl of Lonsdale, with a view to his holding a position of principal of the college in connection with the living. The principal selects his own staff of lecturers. The expenses are defrayed from the fees paid by the students—£10 each term. The college course extends over two years, each divided into two terms, from about Jan. 28 to May 5, and Aug. 25 to Dec. 5. During this period, the standard English divinity works, with the Greek Testament, are chiefly studied, and the composition of sermons, etc., practiced. The students reside in lodgings in the village, under the control of the principal, and attend the service daily in the parish church, the transepts of which were restored in 1855 for their accommodation. A new lecture room and library were built in 1863, adjoining the ancient structure. Students are admitted at the age of 21, on producing testimonials of character, etc., satisfactory to the principal. Graduates of a university where there is no divinity course are admitted to the second year's course on producing their diploma, along with the usual testimonials as to their fitness for the ministry. Students who have passed the course are not now confined to the northern province, as was the original design, but are admitted into most of the southern dioceses. The average number of students in the college is about 100. Near the church is an endowed grammar school. Saint Bees is in some repute as a sea-bathing place.

SAINT BERNARD, a parish in extreme s.e. Louisiana; bounded by the gulf of Mexico, the Mississippi, and lake Borgne, on the s.e., n., and n.w. respectively; about 680 sq. m.; pop. '90, 4326, chiefly of American birth, includ. colored. The surface is low and level; sweet-potatoes, sugar-cane, and molasses are the staples. Parish seat, Saint Bernard.

SAINT BERNARD, GREAT. See BERNARD, GREAT ST.

SAINT BERNARD, LITTLE. See BERNARD, GREAT ST.

SAINT CATHARINE'S, city and co. seat of Lincoln co., Ontario, Canada; on the Welland canal and the Grand Trunk, the Welland, and the Niagara Central railroads; 12 miles n.w. of Niagara Falls. The city is very flourishing, and has large manufactures of machinery and agricultural implements. The surrounding country is very picturesque. The well-known mineral well of Saint Catharine's, whose water is of great value as a remedial agent, supplies on an average 130,000 gallons a day. Of these waters, a large quantity, partially evaporated, is sent out through the country. A second well, similar to the first, is also in use. Saint Catharine's has been called the Saratoga of British America. Its hotels are equal to any in the province. There are gas and electric lights, gravity system of waterworks, good sewerage, and superior educational institutions. Pop. '91, 9170.

SAINT CHARLES, a parish in s.e. Louisiana, s. of lake Pontchartrain; bounded on the s.e. by lake Washa, drained by the Mississippi river; on the Texas and Pacific and the Illinois Central railroads; about 288 sq. m.; pop. '90, 7737, includ. colored. The surface is level and the soil fertile. Principal productions are cotton, rice, and sugar-cane. Parish seat, Hahnville.

SAINT CHARLES, a co. in e. Missouri, adjoining Illinois, bounded on the n. by the Mississippi and Copper rivers, on the s.e. by the Missouri river; traversed by the Missouri, Kansas, and Texas and the Wabash railroads; about 520 sq. m.; pop. '90, 22,977, includ. colored. The surface is moderately hilly and well wooded. Bituminous coal is found. The soil is fertile. The principal productions are corn, wheat, oats, and live stock. Co. seat, Saint Charles.

SAINT CHARLES, city and co. seat of St. Charles co., Mo.; on the Missouri river and the Wabash, the Missouri, Kansas, and Texas, and the Burlington Route railroads; 20 m. w. of St. Louis. It is the seat of St. Charles college (M. E., S.), the Lindenwood female college, the convent of the Sacred Heart, and the co. asylum, and has St. Joseph's hospital, public school, convent, St. Charles Borromeo and St. Charles libraries, national and savings banks, electric lights, about 10 churches, and several daily and weekly newspapers. The river is here crossed by an iron railroad and highway bridge that cost \$1,750,000. The principal manufactures are cars, tobacco, and cob pipes, and the city is a large grain and coal market. Pop. '90, 6161.

SAINT CLAIR, a co. in n.e. central Alabama; drained by the Cahawba and Coosa rivers, the latter its s.e. boundary; traversed by the Ashville and Coosa and the Alabama Great Northern railroads; 648 sq. m.; pop. '90, 17,353, chiefly of American birth, includ. colored. Surface broken and in great part woodland; cotton, corn, grass, and pork are the staples. Bituminous coal is found. Co. seat, Ashville.

SAINT CLAIR, a co. in s.w. Illinois; bounded on the w. by the Mississippi river, watered by Kaskaskia river, Silver and Richland creeks; traversed by the St. Louis, Alton, and Terre Haute, the Illinois Central, the Louisville and Nashville, the Louisville, Evansville, and St. Louis, and the St. Louis, Belleville and Southern railroads; about 680 sq. m.; pop. '90, 66,571, chiefly of American birth. The surface is rolling. The soil is fertile. The principal productions are corn, wheat, and oats. Coal is found. Co. seat, Belleville.

SAINT CLAIR, a co. in e. Michigan, bounded on the e. by lake Huron and the St. Clair river, on the s. by lake St. Clair; watered by Black and Bell rivers and Mill

creek, crossed by the Grand Trunk, the Chicago and Grand Trunk, and the Flint and Père Marquette railroads; about 705 sq. m.; pop. '90, 52,105, chiefly of American birth. The surface is rolling and heavily wooded. The soil in the s. is fertile. The principal productions are wheat, corn, oats, and wool. Co. seat, Port Huron.

SAINT CLAIR, a co. in s.w. Missouri, drained by the Sac and the Osage rivers, and Warbieau creek, traversed by the Missouri, Kansas and Texas, the Kansas City, Fort Scott, and Memphis, and the Kansas City, Osceola, and Southern railroads; about 690 sq. m.; pop. '90, 16,747, chiefly of American birth. The surface is prairie or woodland. The soil is fertile. The principal productions are corn, oats, and live stock. Co. seat, Osceola.

SAINT CLAIR, a city in St. Clair co., Mich.; on the St. Clair river and the Michigan Central railroad; 50 miles n.e. of Detroit. It contains the Ladies' library, public high school, waterworks, savings bank, and several churches, and has ferry communication with Courtright, Canada, and manufactures of lumber, salt, brick, foundry and iron-works products, leather, sash, doors, and blinds, ale, beer, planing mill products, and ships. Pop. '90, 2,353.

SAINT CLAIR, a borough in Schuylkill co., Pa.; on Mill creek and the Pennsylvania and the Philadelphia and Reading railroads; 3 miles n. of Pottsville. It has electric lights, electric street railroads, waterworks, manufactures of mining apparatus, and large anthracite coal mines. Pop. '90, 3,680.

SAINT CLAIR, ARTHUR, 1734-1818; b. at Thurso, Caithness-shire, Scotland; educated at the university of Edinburgh. He joined the British army as an ensign, and, in 1758, came to America with admiral Boscawen; served with distinction under Amherst at Louisburg, and under Wolfe at Quebec; resigned his commission in 1762, and held various civil offices until the breaking out of the revolution, when he joined the colonial army with the rank of col. Promotion rapidly followed upon his gallant services at the battles of Three Rivers, Princeton, and Trenton, until in 1777 he was raised to the rank of maj.-gen., and placed in command at Ticonderoga. That point he was forced to surrender to Burgoyne, and although acquitted of all blame by court-martial, his consequent unpopularity lost him his command. Remaining in the army as a volunteer he again rose to important positions, distinguishing himself under Washington in the campaign which ended with the surrender of Cornwallis, and afterward under Greene. He was a member of the continental congress 1785-87, becoming its president in the latter year. In 1788 he was made the first governor of the Northwest territory, which position he held until 1802. Meanwhile, becoming, in 1791, commander-in-chief of the U. S. army, he was sent on an expedition against the Miami Indians, which ended in the disastrous rout of his forces. A committee of investigation appointed by congress exonerated him, but he resigned his command in May, 1792. His last years were spent in poverty and obscurity.

SAINT CLOUD, city and co. seat of Stearns co., Minn.; on the Mississippi river and the Great Northern and the Northern Pacific railroads; 75 miles n.w. of St. Paul. It is the seat of one of the state normal schools and of the Minnesota state reformatory, and has a public library, hospital, Empire and Central parks, electric lights, electric street railroads, waterworks supplied from the river, national and private banks, a large number of granite quarries, the general car shops of the Great Northern railroad, saw and flour mills, and daily and weekly newspapers. Manufacturing is largely facilitated by power derived from the falls in the river, and the city has large grain interests. Pop. '90, 7,686.

SAINT CROIX, an American river, called also the Passamaquoddy, which, flowing out of Grand lake, on the eastern border of Maine, runs e.s.e. 75 m. to Passamaquoddy bay, and forms a portion of the boundary between the United States and New Brunswick.

SAINT CROIX, a river of Wisconsin, rising near the w. end of lake Superior in Douglas co., and emptying into the Mississippi about 38 m. below St. Paul. Its course is s.w. and s., and for a part of its length it forms the boundary between Wisconsin and Minnesota. There are several waterfalls, and near its mouth the river expands to form St. Croix lake, 36 m. long and 4 wide. The length of the stream is about 200 miles.

SAINT CROIX, a co. in w. Wisconsin, adjoining Minnesota; bounded w. by the St. Croix river, and drained by its branches; traversed by the Chicago, St. Paul, Minneapolis, and Omaha railroad; 730 sq. m.; pop. '90, 23,139, chiefly of American birth. The surface is hilly but fairly fertile; wheat, hay, oats, cattle, and lumber are the staples. Co. seat, Hudson.

SAINT DOMINGO. See HAYTI.

SAINT DOMINGO BARK. See CARIBBEE BARK.

SAINTE-BEUVE, CHARLES-AUGUSTIN, a French poet and critic of great eminence, was b. at Boulogne-sur-Mer, on Dec. 23, 1804. His father, who died two months before his birth, was *principal des droits réunis* at that port. His mother, a woman of superior character and intelligence, was by family originally English, and through her the boy early acquired a familiarity with the English language and literature. He was educated at an institution of his native place, and afterward at the collège Charlemagne in Paris.

On leaving college, though his bent toward literature was already pronounced, he was shy of committing himself to it as a profession, and betook himself to the study of medicine and anatomy. Shortly he obtained a situation at the hospital St. Louis. Here for some time he worked steadily; but his spare time was occupied with literature; and his articles contributed to the *Globe* on topics of history, philosophy, and criticism, attracted attention, and in particular procured him the acquaintance of the celebrated M. Jouffroy. While he was thus wavering between literature and the claims of a profession distasteful to him, Victor Hugo's *Odes et Ballades* were published, and the impression made upon him by this work, of which he wrote an enthusiastic *critique*, seems to have determined him finally to a life exclusively literary. He gave up his situation at the hospital, and attached himself to *Le Cénacle*, along with Alfred de Musset, the two Deschamps, and others of the so-called Romantic school. Shortly, he gave to the world his *Tableau Historique et Critique de la Poésie Française, au XVI.^e Siècle* (1828—afterward enlarged in ed. 1843), which at once established his reputation as one of the first critics of the time. His next work, *Les Poésies de Joseph Delorme*, though somewhat coolly received by the public, brought him what perhaps pleased him better than any applause of the multitude, the emphatic approval of Béranger and others of the literary guild. *Les Consolations*, published in 1830, was considerably more successful in hitting the taste of the public. On the cessation of *Le Cénacle*, after the revolution of 1830, Sainte-Beuve attached himself to the *Globe*; and subsequently he wrote much in the *Revue des Deux Mondes*, the *National*, and the *Constitutionnel*. In 1834 appeared his *Volupté*, a work curious as a study of moral pathology, but more curious than pleasing; and in 1840 he published the first volume of his *Histoire de Port Royal*, a work which, in 1860, he completed in five volumes. On Feb. 27, 1845, he received the most distinguished mark of honor which can fall to a Frenchman of letters, by his election to be a member of the academy. In 1850 he began to issue, in the pages of the *Constitutionnel*, the famous series entitled *Causeries de Lundi*, the most delightful of all his works, and that by which he is most widely known. After the *coup d'état* of Dec. 2, 1851, he became connected with the *Moniteur*, and was appointed professor of Latin poetry at the Collège de France. Of this appointment some fruits are before the world in his *L'Etude sur Virgile*, published in 1857. In 1865 he was called to be a member of the senate. He died Oct., 1869.

As a poet Sainte-Beuve, despite the fine talent he displayed, never succeeded in becoming popular, nor can very high rank be accorded him. But as critic, he was "himself alone," and his place is by common consent in the very fore-front of French literature. His sympathies were wide and catholic; in delicacy of perception, and subtlety of refined analysis, he was almost without a rival; his style is piquant, lively, fascinating, instinct with individual expressiveness; and nothing can exceed the felicity with which the interest of criticism proper is combined in his sketches with that of anecdotic biography.

Of his works not already glanced at, the following only need be mentioned: *Poésies Complètes* (1840); *Critiques et Portraits Littéraires* (1832-39); *Portraits Littéraires* (1844); *Portraits Contemporains*; *Causeries de Lundi* (1851-57); *Nouveaux Lundis* (1863); *Souvenirs et Indiscrétions*. *Le Dîner du Vendredi-Saint* (1872). A selection from the *Causeries de Lundi* has been translated into English, with an introduction, under the title *English Portraits* (1875).—See C. A. Sainte-Beuve, *sa Vie et ses Œuvres*, by D'Haussonville (1875); and an article in No. 281 of the *Quart. Rev.*

SAINTE-CLAIRE DEVILLE, HENRI ÉTIENNE, French chemist, was b. Mar., 1818, at St. Thomas, West Indies, and was educated in France. On quitting college, he constructed at his own cost a chemical laboratory, and for nine years, without master and without pupils, devoted himself to patient studies and skillful researches. In 1844 he was commissioned to organize the faculty of sciences of Besançon, of which, in the following year, he was appointed dean and professor. In 1851 he succeeded M. Balard in the chair of chemistry in the école normale. After 1853 he supplied the place of M. Dumas in the faculty of sciences of Paris. In 1861 he was chosen a member of the academy of sciences of the institute, in place of M. Berthier in the section of mineralogy.

Sainte-Claire Deville's earliest investigations relate to different essences and resins, and the most important are in the department of mineral chemistry. In 1850 he made known the mode of preparation and the properties of anhydrous nitric acid, a compound whose existence had been up to that date ignored. In 1852 he published an important paper on metallic carbonates and their combinations; and in the following year, a new method of mineral analysis, known as the middle way, in which he proposed the exclusive employment of gases and volatile reagents against the errors arising from the use of the filter.

About the same time he began his researches into aluminium, a metal discovered in 1827 by Wöhler of Göttingen, but still very imperfectly known, and set forth its special properties. Being commissioned by Louis Napoleon to seek the best method of obtaining aluminium at a low price, he made numerous experiments, jointly with M. Debray, in the factory at Javel; and, after some months, succeeded in producing ingots of the metal, which were shown in the exposition universelle of 1855. These experiments, and the properties of aluminium, have been described by Sainte-Claire Deville in scientific

periodicals; and among his later papers are—on the “Three Molecular States of Silicon;” on the “Metallurgy of Platina;” on the “Density of Vapors at very High Temperatures;” on the “Measurement of High Temperatures;” on the “Permeability of Iron to Gases at a High Temperature;” on the “Phenomena of Dissociation in Homogeneous Flames;” and on the “Industrial Preparation of Aluminum and its Compounds.” These papers are published in the *Mémoires* and *Comptes-Rendus* of the académie des sciences de l’institut, and in the *Annales de Chimie et de Physique*. He d. 1881.

SAINTE GENEVIEVE, a co. in east Missouri, adjoining Illinois; drained by the Mississippi river, its n.e. boundary, and by Saline creek; about 450 sq. m.; pop. '90, 9883. Co. seat, Ste. Genevieve.

SAINTE MARIE-AUX-MINES (Ger. *Markirch*), a t. of Germany, in Alsace, on the Liepvrette, 14 m. n.n.w. of Colmar, at the foot of the Vosges mountains. It formerly owed its prosperity to its silver mines, but these are no longer worked. Its chief manufactures are silk, wool and cotton fabrics of various kinds. Pop. '71, 12,319; '85, 11,421; '90, 11,870.

SAINTES, an old t. of France, in the department of Charente-Inférieure, on the left bank of the Charente, 17 m. n.w. of Cognac. In ancient times this town, under the name of *Mediolanum*, was the capital of the Santones, from whom the subsequent province derived the name of Saintonge. It contains interesting Roman remains, as a triumphal arch, and the ruins of an amphitheater, circus, etc. Manufactures agricultural implements and leather dressing. Pop. '91, 18,461.

SAINTE FERDINAND, a tp. in Saint Louis co., Mo.; including the villages of Bridgeton and Saint Ferdinand. Pop. '90, 8399.

SAINT FRANCIS, a co. in e. Arkansas; drained by the St. Francis and Languille rivers; traversed by the Little Rock and Memphis railroad; 612 sq. m.; pop. '90, 13,543. Co. seat Forrest City.

SAINT FRANCIS RIVER, in Arkansas, rises at the base of Iron mountain in Missouri, is the boundary between Arkansas and Missouri for a little distance, flows through n.e. Arkansas, and, after a course of 450 m., empties into the Mississippi.

SAINT FRANÇOIS, a co. in s.e. Missouri; drained by the St. Francis and Big rivers; traversed by the St. Louis, Iron Mountain and Southern railroad; 410 sq. m.; pop. '90, 17,347, of American birth. Co. seat, Farmington.

SAINT-GAUDENS, AUGUSTUS, b. Dublin, Ireland, 1848; began his career as a cameo cutter in New York, and then went to Paris where he studied modeling and drawing. He also studied sculpture in Rome. Among his works are a statue of Hiawatha, a statue of Farragut for New York city, the bas-reliefs in St. Thomas's church, New York, busts of Theodore D. Woolsey, William M. Evarts and Gen. William T. Sherman, the statue of “The Puritan” (Samuel Chapin), erected at Springfield, Mass., the statue of Abraham Lincoln in Lincoln park, Chicago, and the designs for the World's Fair medals of award, 1894.

SAINT GEORGE'S ENSIGN is the distinguishing flag of the British navy. It consists of a red cross on a white field, with a union-jack in the dexter chief corner. Formerly it was usual that an admiral, vice-admiral, or rear-admiral should have his flag red, white, or blue, according to the squadron to which he belonged. By a regulation of 1864, this old custom was altered; the squadrons are abolished, and the white St. George's ensign is the badge of all ships in the navy. The red and blue ensigns are now left to government vessels—not being ships of war—and merchant vessels respectively. The ensign is borne at the peak, or, in harbor, on a flag-staff at the stern; in boats the latter is the only mode of flying it. A full-dress ensign is the largest flag used, being often but little smaller than the quarter-deck of the ship which hoists it.

SAINTE GERMAIN, COUNT DE, b. 18th c.; in what country is unknown. He came to Paris in 1740 with the marquis de Belle Isle. He soon became famous for his acquaintance with the natural sciences, his powers of conversation, and his apparent great wealth. He is said to have given anecdotes implying acquaintance with persons who were dead generations before his time. His character and career were mysterious throughout. It is supposed that he was a spy in some governmental employ. D. 1784.

SAINTE-GERMAIN-EN-LAYE, a t. of France, in the dep. of Seine-et-Oise, on an elevation on the left bank of the Seine, 8 m. w.n.w. of the fortifications of Paris. The old chapel is a beautiful structure. The Château Neuf has been converted into a museum of national antiquities. The old château was occupied by Francis I., Louis XIV., and others. The town is now a very popular summer resort.

Saint-Germain-en-Laye had its origin in a monastery built by king Robert in the beginning of the 11th c., on the summit of the hill which was surrounded by the forest of Lyda (*Laye*), and dedicated to St. Germain. The town, as well as the royal château, which was built either during the reign of king Robert, or soon after, was sacked by the English in 1346, in 1419, and in 1438. At Saint-Germain-en-Laye the marriage of Francis I. was celebrated, and this king rebuilt the château in 1547. From before the time of Philippe-Auguste, Saint-Germain-en-Laye had been the residence of the French court during a portion of the year, but Louis XIV. transferred the court to Versailles, and from this time the fortunes of Saint-Germain-en-Laye declined. Later the château

of Saint-Germain-en-Laye was assigned by Louis XIV. as the residence of the dethroned James II. of England, and here in exile that monarch held his morose court, devoting almost the whole day to religious observances. The château is now used as barracks and for other purposes. Pop. of commune, '91, 14,262.

SAINT HELENA, a parish in e. Louisiana, adjoining Mississippi, watered by the Amite and Tickfaw rivers, and Natalbany creek; about 420 sq. m.; pop. '90, 8062, includ. colored. The surface is rolling, and mostly woodland. The soil along the streams is fertile. The principal productions are corn, cotton, wool, and cattle. Co. seat, Greensburg.

SAINT HELENS, a parl. and municipal borough and market town of Lancashire, on a small affluent of the Mersey, 3 m. e.n.e. of Prescot by railway. It is a straggling, ill-built, but thriving town, with an extensive trade in coal, and containing plate-glass, copper, bottle, and other works. The town also contains collieries and deposits of stone-ware, clay, and fire-clay. Pop. '61, 18,396; '81, 51,234; '91, 71,288.

SAINT HELIERS, capital of Jersey (q. v.), seaport, market town, and parish, is situated on the s. shore of the island, and on the e. side of St. Aubin bay, lat. 49° 10' n., long. 2° 7' west. It is defended by Elizabeth castle, on a rocky island off the shore, approached by a causeway at low water; and by fort Regent, on the s.e. side of the town, built about 1806, on a scarped granite rock, at an enormous expense. In the year 1867 a great extension of the harbor works was found to be necessary. At spring tides, the water rises 40 feet. Victoria college—a handsome edifice, built on an eminence, in 1851—the hospital, the theater and the churches are the chief buildings. The area of the town has rapidly increased within recent years. An active trade is carried on with England, France, and India. Pop. '91, 29,100.

SAINT-HILAIRE, JULES BARTHÉLEMY. See BARTHÉLEMY SAINT HILAIRE, JULES.

SAINT HYACINTHE, a co. in s. Quebec, Dominion of Canada, having the Richelieu river for its w. boundary; intersected by the Grand Trunk railway; 263 sq. m.; pop. '91, 21,433. It is drained by the Richelieu and Yamaska rivers, the latter forming its e. boundary. Its surface is generally level, and the soil is fertile. It has manufactures of woolen goods, wooden ware, lace, iron castings, organs, boots and shoes, etc. Co. seat, Saint Hyacinthe.

SAINT HYACINTHE, city and co. seat of Saint Hyacinthe co., Quebec, Canada; on the Yamaska river and the Grand Trunk, the Canadian Pacific, the Drummond County, and the United Counties railroads; 30 miles e.n.e. of Montreal. It contains a Roman Catholic cathedral, Saint Hyacinthe college, the monasteries of the Precious Blood and Dominican fathers, the Dairy school experiment station, several banks and agencies, and manufactures of leather, organs, tools, boots, and shoes, woolen and flannel goods, hosiery, machinery, and farming implements. The college is noted for its thorough equipment of library, chemical laboratory, and physical and astronomical apparatus, and the Roman Catholic church has provided about a dozen other institutions of education and charity. There are several daily and weekly newspapers, the majority published in the French language. Pop. '91, 7,016.

SAINT IGNATIUS'S BEANS. See IGNATIUS (ST.) BEANS; NUX VOMICA.

SAINTINE (the pseudonym of JOSEPH XAVIER BONIFACE), 1798-1865; b. Paris; published in 1823 a collection of poems of some merit. He won in 1837 the Monthyon prize by his story, *Picciola*, the most popular of his novels. He published, in conjunction with Scribe and other dramatists, more than 200 plays.

SAINT IVES, a municipal borough, parish, seaport, and market t. of England, in the co. of Cornwall, beautifully situated on the n.e. shore of the bay of the same name, with an outlook on the Bristol channel, about 57 m. w.s.w. of Plymouth. It is a very old and picturesque town; its church, a granite building of the early part of the 15th c., stands on the beach, and is reached by the spray in rough weather. Its harbor admits vessels of 200 tons. Saint Ives is the head-quarters of the pilchard-fishery. In the vicinity are several important tin mines. A pier and breakwater have been built. Pop. '91, 6094.

SAINT IVES, a mun. bor., parish and market t. of England, in Huntingdonshire, is situated on the left bank of the Ouse, 5 m. e. of Huntingdon. A very large weekly cattle and corn market is held here. Brewing and malting are the chief branches of industry. Pop. '91, 3037.

SAINT JACOB, a Swiss hamlet a mile s. of Basle, noted as the scene of a great battle in 1444 between 1600 Swiss and a much larger French force. The Swiss fought for ten hours, and slew three times their number, but were themselves all destroyed except ten men. The place is known as the *Swiss Thermopylae*, and the wine of the neighborhood is called *Schweizer blut*, or *Swiss blood*.

SAINT JAMES, a parish in s.e. Louisiana, bounded by lake Maurepas on the n.e.; drained by the Mississippi; on the Yazoo and Mississippi Valley and the Illinois Central railroads; about 300 sq. m.; pop. '90, 15,715, includ. colored. The surface is level. The soil is fertile. The principal productions are corn, cotton, tobacco, rice, molasses, and sugar. Co. seat, Convent.

SAINT JAMES OF THE SWORD, a military order in Spain, first instituted in the reign of Ferdinand II., king of Leon and Galicia. In the first instance it was organized with a view to stopping the inroads of the Moors, and its members pledged themselves to secure the safety of the roads. They entered into a league with the brethren of St. Eloy, and the order was confirmed by the pope in 1175. The highest rank in the order is that of grand-master, which is united to the crown of Spain. The knights were obliged to prove their noble descent at least four generations back, and to show that they numbered among their ancestors no Jews, Saracens, or heretics, and had never been cited by the inquisition.

SAINT JAMES'S PALACE, a large inelegant brick structure, fronting toward Pall Mall, succeeded Whitehall as the London residence of the British sovereigns, and remained as such from William III. to Victoria. It was reconstructed and made a manor by Henry VIII., having before been a hospital dedicated to St. James; Henry also annexed to it a park, which he inclosed with a brick wall, to connect St. James's with Whitehall, the then royal residence. Additions and improvements gradually made, totally changed the original palace, so that at the present time little, if any, of the old structure remains. In 1837 the royal household was transferred to Buckingham palace, and St. James's is now used only for levees and drawing-rooms.—The court of St. James's is the usual designation of the British court.

ST. JAMES'S PARK lies southward from the palace, and extends over 87 acres. Within the last 40 years it has been greatly improved, and is now richly embellished with avenues of trees, and a fine piece of water in the center, which is stocked with waterfowl. On the e. side is the *parade*, where the body-guards on duty are mustered, and where the regimental bands perform in fine weather. On the outskirts are situated the Buckingham and St. James's palaces, Stafford house, Marlborough house, etc.

SAINT JANUARIUS, a martyr of the Christian faith under Diocletian, was a native of Benevento, or at least became bishop of that see in the latter part of the 3d century. According to the Neapolitan tradition, he was taken prisoner at Nola; and the place of his martyrdom, in 305, was Pozzuoli, where many Christians suffered the same fate. His body is preserved at Naples, in the crypt of the cathedral, and in a chapel of the same church are also preserved the head of the martyr, and two phials (*ampulle*) supposed to contain his blood. On three festivals each year, the chief of which is the day of the martyrdom, Sept. 19, and on occasions of public danger or calamity, as earthquakes or eruptions, the head and the phials of the blood are carried in solemn procession to the high-altar of the cathedral, or of the church of St. Clare, where, after prayer of greater or less duration, the blood, on the phials being brought into contact with the head, is believed to liquefy, and in this condition is presented for the veneration of the people, or for the conviction of the doubter. It occasionally happens that a considerable time elapses before the liquefaction takes place, and sometimes it altogether fails. The latter is regarded as an omen of the worst import; and on those occasions when the miracle is delayed beyond the ordinary time the alarm and excitement of the congregation rise to the highest pitch. Those who are curious as to the literature of the controversy regarding this celebrated legend, will find many documents in the 6th volume of the Bollandist *Acta Sanctorum* for September.

SAINT JANUARIUS, ORDER OF, an order of knighthood, founded by king Charles of Sicily (afterward Charles III. of Spain), on July 6, 1738. It was abolished after the French invasion of 1806, and reintroduced in 1814. The badge is a gold octagonal white and red enameled cross, with gold lilies in the upper and side angles. The obverse represents St. Januarius in episcopal robes, with an open book. The round middle of the reverse shows a golden open book, and two phials partly filled with blood. The knights are either *Cavalieri di Giustizia*, who must count four noble generations, or *Cavalieri di Grazia*.

SAINT-JEAN-D'ANGELY, a small t. of France, dep. of Charente-Inférieure, 35 m. s.e. of La Rochelle. Pop. '91, commune, 7297.

SAINT JEAN MOLENBEEK. See MOLENBEEK.

SAINT JOHN, a river in Maine and New Brunswick, 550 m. long, is the dividing line between Somerset co., Maine, and Dorchester co., Quebec; drainage, 26,575 sq. miles. It is known as the s.w. branch at its rise in the Metgermette portage, as the Walloostook or Maine St. John. for the first 112 m., and 150 m. below its source unites with the St. Francis running along the n. boundary of Maine for 75 miles. Just beyond the line it descends in the Grand Falls, with a perpendicular fall of 75 feet. It is navigable at high water to Woodstock, 145 m., and in the spring as high as 40 m. above Grand Falls, by lighters, to the mouth of the Madawaska. By the Ashburton treaty navigation is free to United States citizens. At its entrance into the bay of Fundy it contracts into a narrow channel, and the passage of vessels in and out of the river depends on the state of the tide. At high tide the harbor is from 5 to 8 ft. higher than the river, at low tide the river falls 12 ft. to reach the level of the harbor. It has 11 branches; the principal affluents are the Allagash, the St. Francis, the Madawaska, and the Aroostook.

SAINT JOHN, a co. in s. New Brunswick, lying on the bay of Fundy and drained by the St. John and Kennebecasis rivers; traversed by the Intercolonial and the

Grand Trunk railroads, 585 sq. m.; pop. '91, 49,574. Co. seat, St. John. This is the most populous co. in the province. The surface is diversified and the soil fertile. The greater part of the inhabitants are engaged in fishing and shipbuilding.

SAINT JOHN, city, seaport, and co. seat of Saint John co., New Brunswick, Canada; at the mouth of the Saint John river and on the Intercolonial, the Canadian Pacific, and the Grand Southern railroads; 190 miles n.w. of Halifax. It is built on a rocky peninsula, sloping up from the harbor. The streets are laid out at right angles; they are wide, and some of them are cuttings 40 ft. deep through solid rock. There are many fine public buildings and private houses. The principal building materials are brick and stone. Among the public buildings are the court-house and jail, the provincial insane asylum, market house, post-office, almshouse, city hospital, city hall, Roman Catholic cathedral, public library, reformatory for boys, sailors' home, Wiggins orphan asylum for sailors' sons, Protestant and Roman Catholic orphan asylums, Mechanics' institute, Masonic and Odd Fellows' halls, home for aged females, the railroad depot, and the savings bank. There are gas and electric light plants, electric street railroads, waterworks supplied from Little river, a highway and a steel cantilever railroad bridge across the gorge, about 25 churches, and local, branch, and savings banks. The city has regular steamship communication with Nova Scotia, Prince Edward island, the West Indies, European ports, and Boston. The manufacturing industries are extensive, including ships, lumber, machinery, tools, paper, leather, carriages, boots and shoes, cottons, etc. The entrance to the harbor, which is one of the best on the continent, is protected by Partridge island, on which are a lighthouse and a quarantine hospital. The channel is protected on the e. by a breakwater. The foreign trade is considerable. The chief article of export is lumber. Pop. '91, 39,179.

SAINT JOHN, HENRY. See BOLINGBROKE.

SAINT JOHN, ISAAC MUNROE, 1827-80; b. Greenbrier Bridge, W. Virginia; graduated Yale, 1845, and then studied engineering. Enlisting in the confederate army, he superintended the fortifications of the James river peninsula, was made head of the nitre and mining bureau at Richmond; then of the commissary department. After the war he resumed his profession, became chief engineer of the Louisville, Cincinnati and Lexington railroad, built the Short-line to Cincinnati, and at his death was chief engineer of the Lexington and Big Sandy railroad.

SAINT JOHN, JAMES AUGUSTUS, b. Caermarthenshire in 1801; went to London in 1817; edited a Plymouth radical paper, and published a poem *Abdallah*; was subsequently sub-editor of J. S. Buckingham's *Oriental Review*; in 1827 with David Lester Richardson started the *Weekly Review*; in 1829 removed to Normandy. He traveled extensively in Egypt and Nubia. The following are the most important of his numerous works: *History of the Manners and Customs of Ancient Greece*, 3 vols.; *History of the Manners and Customs of the Hindus*, 2 vols.; *Description of Egypt and Nubia*; *Isis, an Egyptian Pilgrimage*; *Journal of a Residence in Norway*, 2 vols.; *The Nemesis of Power*; *Causes and Forms of Revolution*; *There and Back Again in Search of Beauty*, 2 vols.; *Philosophy at the Foot of the Cross*; *History of the Four Conquests of England*; *Life of Sir Walter Raleigh*. He d. 1875. His son Horace also is a writer of travels.

ST. JOHN, JOHN P., b. Brookville, Ind., 1833. He distinguished himself in the union army during the civil war, and rose to the rank of col. After the war he practiced law in Jackson co., Mo., and removed to Kansas, 1868; was a member of the state senate, 1872, and was elected gov. of the state, 1878. He became an earnest advocate of prohibition of the liquor traffic, and was candidate for pres. of the U. S. on the prohibition ticket, 1884, polling 151,809 votes. He was chairman of the prohibition party's convention in 1888 and 1892, but in 1896, finding the majority of the convention opposed to free silver, government control of railways, etc., withdrew with a number of followers and organized the "National" party.

SAINT JOHN, OLIVER, 1598-1673; b. England; educated at Cambridge and called to the bar. He distinguished himself as one of Hampden's counsel in the ship-money trial in 1637; married in 1638 Elizabeth, cousin of Oliver Cromwell, and was elected to parliament in 1640. He was solicitor-gen. in 1641, and lord chief-justice of the common pleas in 1648. He had no share in the trial of Charles I., but barely escaped proscription after the restoration, when he was forced to take refuge on the continent under an assumed name. He was ambassador to the Netherlands in 1651, and the same year commissioner for the affairs of Scotland, and a member of the council of state.

SAINT JOHN, PERCY BOLINGBROKE, b. England, 1821; traveled with his father James Augustus, and aided him in the preparation of his works. The following are some of his numerous published works: *Young Naturalist's Book of Birds*; *King's Musketeer*; *Paul Peabody*; *Trapper's Bride*; *The Enchanted Rock*; *White Stone Canoe*; *Fireside*; *Three Days of the French Revolution*; *Quadroona, or The Slave Mother*; *The Creole Bride*; *Good as Gold*. He also contributed tales to *Cassell's Illustrated Magazine*. D. 1889.

SAINT JOHN OF JERUSALEM, KNIGHTS OF, otherwise called KNIGHTS OF RHODES, and afterward of MALTA, the most celebrated of all the military and religious orders of the middle ages. It originated in 1048 in an hospital dedicated to St. John the Baptist, which some merchants of Amalfi were permitted by the calif of Egypt to build for the

reception of the pilgrims from Europe who visited the holy sepulcher. The nurses were at first known as the hospitaler brothers of St. John the Baptist of Jerusalem. The Seljuk Turks, who succeeded the Egyptian and Arabian Saracens in Palestine, plundered the hospice, and on the conquest of Jerusalem by the crusaders under Geoffroy de Bouillon in 1099, the first superior, Gérard, was found in prison. Released from duress, he resumed his duties in the hospice, gave material aid to the sick and wounded, and was joined by several of the crusaders, who devoted themselves to the service of the poor pilgrims. By advice of Gérard, the brethren took vows of poverty, chastity, and obedience before the patriarch of Jerusalem. Pope Pascal II. gave his sanction to the institution in 1113. Raymond du Puy, the successor of Gérard in the office of superior, drew up a body of statutes for the order, which was confirmed by pope Calixtus II. To the former obligations was afterward added those of fighting against the infidels and defending the holy sepulcher. Various hospices, called *commanderies*, were established in different maritime towns of Europe as resting-places for pilgrims, who were there provided with the means of setting out for Palestine. The order having become military as well as religious, was recruited by persons of high rank and influence, and wealth flowed in on it from all quarters. On the conquest of Jerusalem by Saladin in 1187, the hospitalers retired to Margat in Phenicia, whence the progress of infidel arms drove them first in 1285, to Acre, and afterward, in 1291, to Limisso, where Henry II., king of Cyprus, assigned them a residence. By the statutes of Raymond, the brethren consisted of three classes, knights, chaplains, and serving brothers; these last being fighting squires, who followed the knights in their expeditions. The order was subsequently divided into eight languages—Provence, Auvergne, France, Italy, Aragon, England, Germany, and Castile. Each nation possessed several grand priories, under which were a number of commanderies. The chief establishment in England was the priory at Clerkenwell, whose head had a seat in the upper house of parliament, and was styled first baron of England.

In 1310, the knights, under their grand-master, Foulkes de Villaret, in conjunction with a party of crusaders from Italy, captured Rhodes and seven adjacent islands from the Greek and Saracen pirates, by whom it was then occupied, and carried on from thence a successful war against the Saracens. In 1523, they were compelled to surrender Rhodes to sultan Solymán, and retired first to Candia and afterward to Viterbo. In 1530, Charles V. assigned them the island of Malta, with Tripoli and Gozo. The knights continued for some time to be a powerful bulwark against the Turks; but after the Reformation a moral degeneracy overspread the order, and it rapidly declined in political importance; and in 1798, through the treachery of some French knights and the cowardice of the grand-master, D'Hompesch, Malta was surrendered to the French. The lands still remaining to the order were also about this time confiscated in almost all the European states; but though extinct as a sovereign body, the order has continued during the present century to drag on a lingering existence in some parts of Italy, as well as in Russia and Spain. Since 1801 the office of grand-master has not been filled up: a deputy grand-master has instead been appointed, who has his residence in Spain. The order at first wore a long black habit, with a pointed hood, adorned with a cross of white silk of the form called Maltese on the left breast, as also a golden cross in the middle of the breast. In their military capacity, they wore red surcoats with the silver cross before and behind. The badge worn by all the knights is a Maltese cross.

SAINT JOHN, LAKE, the name of a considerable body of water in the Canadian province of Quebec in which the Saguenay has its source, and into which flow several important streams, among them the Peribonca, about 400 miles long, and the Mistassini, about 300 miles long. On the shores of the lake are the settlements of Herbertville, St. Gédéon, and Jonquière, and a railway connects the city of Quebec with the lake. The surrounding district is fertile, and game abounds. The chief trade of the inhabitants dwelling near its shores is in agricultural produce and lumber. The lake has been the resort of sportsmen on account of the abundance of its fish.

ST. JOHNLAND, a unique charity, founded by the late Dr. Muhlenberg, situated on ground purchased in 1865, in Smithtown, about 48 m. e. of Brooklyn, L. I. The plan of the founder, which has been fully carried out, was to provide cheap and comfortable suburban homes for deserving working men and women; to furnish abodes for the aged and helpless, as well as for orphaned children; and to carry to this home, surrounded by an enlightened Christianity, waifs rescued from the streets of New York and Brooklyn. Large numbers of boys have thus been taken from evil surroundings, and taught honest trades. Cottages, neatly and comfortably arranged, are provided for the use of working men; they cost \$2000 if double, \$1000 if single. The town of St. Johnland was incorporated, 1870. Pres. of the society, John H. Earle; supt. and asst. treas., Sister Annie Ayres.

SAINT JOHN'S, a co. in n.e. Florida, drained by the St. John's river and its affluents; about 990 sq. m.; pop. '90, 8712, inclu. colored. The surface is level and low, with much marsh, and forests of live oak. The soil is fairly fertile. The principal productions are corn, rice, sugar, and molasses. Co. seat, St. Augustine.

SAINT JOHNS, a co. in s.w. Quebec, Canada, adjoining New York; drained by the Richelieu river, its e. boundary; intersected by the Grand Trunk, the Canadian Pacific,

and the Central Vermont railways; 175 sq. m.; pop. '91, 12,282, mostly of French descent. The surface is diversified and the soil fertile; wheat, oats, hay, potatoes, and dairy products are the staples. Co. seat, St. Johns.

SAINT JOHN'S, city and capital of Newfoundland, 2000 m. from Liverpool, 1640 m. from Valentia, Ireland, 900 m. from Quebec, 540 m. from Halifax, Nova Scotia, 65 m. n. of cape Race, 18 m. s. of cape St. Francis, 1665 m. w. of Galway (the shortest distance between any American and European seaport); pop. '92, 31,142. At the entrance to the harbor are the narrows, 360 fathoms across outside; 95 fathoms at the narrowest, measuring from Chain rock to Pancake rock. On the n. side of the narrows is a cliff of sandstone and slate rock, 300 ft. high, and above that towers Signal hill, 510 ft. above the level of the sea. On the s. side of the narrows there is a hill 650 ft. high, on which is a lighthouse called Fort Amherst. There were formerly batteries posted on these hills, while it was a garrisoned town. At the narrows there are 12 fathoms of water in the channel, which, however, will admit of the passage of only one vessel at a time. Inside the narrows the harbor widens and expands toward the s.w. It has 90 ft. of water in the center, accessible to vessels of the deepest draught, there being no perceptible tide to interfere. The city is built principally on the n. side of the harbor, on sloping ground admirably situated. The n. and s. sides are connected by a causeway and bridges. The principal street is more than a mile in length, on which the buildings are all of brick or stone, wooden buildings not having been allowed there since the fire of 1846; on other streets the law does not apply. It has substantially built stores, warehouses, and wharves. Cape Spear and Fort Amherst lights give guidance to vessels entering the harbor, and in addition there are a 32-lb. gun, fired every half hour, and a compressed air trumpet. It has a dry-dock capable of raising vessels of 600 tons, and a marine railway. At the foot of the ridge of steep hills on the s. side of the harbor which extend at the same altitude for miles into the interior, are the steam seal-oil factories and store-houses. The Roman Catholic cathedral stands on the top of the hill above the city 225 ft. above the sea, erected at a cost of \$800,000. There is also an Episcopal cathedral costing \$250,000. The water supply is brought 4 miles from Windsor lake. It is lighted by gas and electricity, and has several branch banks. It is the seat of St. Bonaventure college (R. C.), and of Anglican, Methodist, and Presbyterian colleges, and has several convents. It has academies under the supervision of different denominations; life, fire, and marine insurance companies, agricultural, horticultural, and fishermen's societies, and many benevolent and charitable organizations. It has a medical society incorporated 1867, the St. John's atheneum, having a large library, and the library of the St. Joseph's Catholic institute. Among the conspicuous public buildings are the government-house, the residence of the governor, costing \$240,000, the house of assembly, the lunatic asylum 4 m. from the city, the public hospital, market-house, court-house, penitentiary, custom-house, poor-house, and savings banks. The city is governed by the legislature. It is a station of the Allan line of European steamers, weekly in all months but February, March, and April, when they run fortnightly. Regular fortnightly lines of steamers ply between this place and the principal ports on the coast. It receives the bulk of the imports of the colony, and has an important trade in clothing, fishermen's and hunter's outfits, and provisions. Its capitalists are mostly non-resident. The manufactures are principally ship-bread baked by machinery, nets, iron, boots and shoes, furniture, etc. It has distilleries, block-factories, oil refineries, breweries, and tanneries. Business connected with the fisheries absorbs general attention; employing steamboats in the place of sailing vessels, exporting seal, cod, and oil. Most of the oil is manufactured in the city. The city has been improved greatly since the disastrous fire of 1892.

SAINT JOHNS, chief town in the district of Iberville, Quebec, Canada; on the Richelieu river and the Grand Trunk, Canadian Pacific, and other railroads; 27 miles s.e. of Montreal. It contains the county and district buildings, several important manufacturing, and electric light and water plants, and has a large trade in lumber and grain. Pop. '91, 4722.

SAINT JOHN'S, a city of the West Indies, capital of the island of Antigua (q.v.), and the residence of the governor-in-chief of the Leeward islands, is situated at the western side of that island, close to the shore. Pop. '91, 8515. The town is well laid out, having spacious streets, of which the principal run e. and w., being so arranged in order to obtain full advantage of the refreshing easterly or trade winds, which prevail here from April to August. The harbor is comparatively shallow, and there is a bar across the mouth of it, so that vessels heavily laden are obliged to drop anchor outside. The cathedral, the court-house, and the new market-house are the chief edifices. The great earthquake of 1843 which destroyed Pointe-à-Pitre did much damage to the town.

SAINT JOHN'S, EVE OF, one of the most joyous festivals of Christendom during the middle ages, was celebrated on midsummer eve. From the account given of it by Jakob Grimm in his *Deutsche Mythologie* (Bd. i., pp. 583-593), it would appear to have been observed with similar rites in every country of Europe. Fires were kindled chiefly in the streets and market places of the towns, as at Paris, Metz, etc.; sometimes, as at Gernsheim, in the district of Mainz, they were blessed by the parish priest, and prayer and praise offered until they had burned out; but, as a rule, they were secular in their char-

acter, and conducted by the laity themselves. The young people leaped over the flames, or threw flowers and garlands into them, with merry shoutings; songs and dances were also a frequent accompaniment. At a comparatively late period, the very highest personages took part in these festivities. In England, we are told (see R. Chambers's *Book of Days*, June 24), the people on the eve of St. John's "were accustomed to go into the woods and break down branches of trees, which they brought to their homes, and planted over their doors, amid great demonstrations of joy, to make good the prophecy respecting the Baptist, that many should rejoice in his birth. This custom was universal in England till the recent change in manners. Some of the superstitious notions connected with St. John's eve are of a highly fanciful nature. The Irish believe that the souls of all people on this night leave their bodies, and wander to the place, by land or sea, where death shall finally separate them from the tenement of clay. It is not improbable that this notion was originally universal, and was the cause of the widespread custom of watching or sitting up awake on St. John's night, for we may well believe that there would be a general wish to prevent the soul from going upon that somewhat dismal ramble. In England, and perhaps in other countries also, it was believed that, if any one sat up fasting all night in the church porch, he would see the spirits of those who were to die in the parish during the ensuing twelve months come and knock at the church door, in the order and succession in which they were to die. We can easily perceive a possible connection between this dreary fancy and that of the soul's midnight ramble." The kindling of the fire, the leaping over or through the flames, and the flower-garlands, clearly shown that these rites are essentially of heathen origin, and of a sacrificial character. They are obviously connected with the worship of the sun, and were doubtless practiced long before the Baptist was born. In old heathen times, midsummer and yule (q. v.), the summer and winter solstices, were the two greatest and most widespread festivals in Europe. The church could not abolish these; it could only change their name, and try to find something in the history of Christianity that would justify the alteration.

SAINT JOHN'S BREAD. See CAROB.

SAINT JOHNSBURY, town and co. seat of Caledonia co., Vt.; on the Passumpsic river and the Boston and Maine and the Saint Johnsbury and Lake Champlain railroads; 38 miles n.e. of Montpelier. It contains the Saint Johnsbury atheneum, Saint Johnsbury academy, museum of natural science, Roman Catholic hospital, convent of the congregation of Notre Dame, electric light and street railroad plants, separate water systems for fire and domestic purposes, national and savings banks, and the largest scale and balance manufactory in the world. Pop. '90, 6567.

SAINT JOHN'S COLLEGE, at Fordham in the city of New York, a Roman Catholic institution, but open to students of all religious denominations, was organized in 1841. It enjoys the powers and privileges of a university, and is conducted by the Jesuit fathers. The grounds are extensive, well laid out for college purposes, and afford uncommon facilities for athletic sports, for bathing, and for skating. Ample opportunities are also provided for indoor amusements. The buildings are spacious, thoroughly ventilated, well heated by steam, lighted by gas, and provided with bath-rooms. The college has no endowment, and no revenue but the fees of the students and the products of the farm. The laboratories and their apparatus, and the cabinet of natural history, occupy a separate building. The library contains 20,000 volumes, besides a circulating library of 5,000 volumes. The correspondence of students is under the supervision of the college authorities. No books, papers, periodicals, etc., are allowed among the students until they have been examined and approved. Number of professors (1897), 13; other instructors, 12; students, 230; alumni, about 560. President, Rev. T. J. Campbell, S.J.

SAINT JOHN'S COLLEGE, Cambridge, was founded in 1511 by lady Margaret, countess of Richmond, and mother of Henry VII.; but her death happening before the design was completed, her executors, one of whom was Fisher, bishop of Rochester, carried her intentions into effect. The site of the college had been long before devoted to pious uses, but three times was the disposition of the property altered—1st, when Neal, bishop of Ely, founded here a hospital for canons regular in 1134; 2dly, when Hugh de Balsham made it into a priory, dedicated to St. John the evangelist; 3dly, when lady Margaret's executors converted it into a college. The foundation is for a master, who is elected by the society; 56 fellows, 60 scholars, and 9 proper sizars. There are also numerous exhibitions of considerable value, and 8 minor scholarships open every year to competition for students who have not yet commenced residence in the university. Among names of interest may be mentioned William Grindal, tutor to queen Elizabeth; Roger Ascham; Cecil lord Burleigh; Richard Bentley (who became master of Trinity college); Kirke White, the poet; Henry Martyn, etc. See Cooper's *Memorials of Cambridge*.

SAINT JOHN'S RIVER, in s.e. Florida, rising in the Cypress swamp, Brevard co., flows through Orange co., forming the dividing line between Marion, Putnam, and Clay on the w., and St. John's co. on the e., emptying into the Atlantic ocean in Duval co.; 15 m. e. of Jacksonville. It runs in a channel due n. and s. 20 m. from the coast and parallel with it, until it reaches Jacksonville, whence it takes an e. course to the sea. It is nearly 400 m. long, and is navigable by large steamers 230 m. to Enter-

prise (a fashionable winter resort with sulphur springs), and for lighters 60 m. above. For the first 100 m. from its source it forms a sheet of water 5 m. in width, then deepening and forming a channel, it measures 1 m. in width for two-thirds of its course, expanding into a few small lakes in the s. and Lake Monroe and Lake George, considerable bodies of water, farther north. It is a smoothly flowing stream, bordered by orange groves, with little perceptible current. It will admit vessels of from 14 to 15 ft. draught at Jacksonville (above the bar, which has a minimum depth of 7 ft.), of 10 ft. to Pilatka, and of 8 ft. to Lake George.

SAINT JOHN'S WORT. See *HYPERICACEÆ*.

SAINT JOHN THE BAPTIST, a parish in s.e. Louisiana; bounded e. by Lake Pontchartrain, n. by Lake Maurepas, and intersected by the Mississippi river; 195 sq.m.; pop. '90, 11,359, chiefly of American birth, 5831 colored. The surface is level and very low; corn, sugar, molasses, and rice are the staples. Parish seat, Edgard.

SAINT JOSEPH, a co. in n. Indiana adjoining Michigan; drained by the Kankakee and Saint Joseph rivers; on the Lake Shore and Michigan Southern, the Chicago and Grand Trunk, and other railroads: about 470 sq. m.; pop. '90, 42,457. The surface is level prairie or woodland. The soil is extremely fertile. The principal productions are corn, wheat, oats, dairy products, and live stock. Co. seat, South Bend.

SAINT JOSEPH, a co. in s. Michigan, adjoining Indiana, drained by the St. Joseph, the Portage, the Prairie, and the Fawn rivers; on the Lake Shore and Michigan Southern, the Michigan Central, and the Grand Rapids and Indiana railroads; about 504 sq. m.; pop. '90, 25,356, chiefly of American birth. The surface is rolling. The soil is fertile. The principal productions are corn, wheat, wool, hay, and dairy products. Co. seat, Centreville.

SAINT JOSEPH, city and co. seat of Buchanan co., Mo.; on the Missouri river and the Atchison, Topeka, and Santa Fé, the Burlington Route, the Chicago Great Western, the Chicago, Rock Island, and Pacific, the Missouri Pacific, and the St. Joseph and Grand Island railroads; 60 miles n.w. of Kansas City. It was founded by Joseph Ribideaux in 1843; incorporated as a town in 1845; and chartered as a city of the second class in 1885. It contains the state lunatic asylum, Ensworth hospital, St. Joseph hospital, public library, U. S. custom-house, board of trade building, high school, Ensworth and Central medical colleges, college of St. Joseph (non-sect.), academy of the Sacred Heart (R. C.), public school property valued at over \$600,000, Krug and several other public parks, electric light and street railroad plants, and waterworks supplied from the river. There are a combined railroad and highway bridge across the river, several national and state banks, numerous churches including St. Joseph's cathedral (R. C.), and many daily, weekly, and monthly periodicals. The U. S. census of 1890 reported for Saint Joseph, 276 manufacturing establishments, employing \$5,230,697 capital and 5,026 persons, paying \$2,351,691 for wages and \$7,848,353 for materials, and having combined output valued at \$11,916,141. The principal manufactures are flour and grist mill products, clothing, boots and shoes, overalls, shirts, machinery, furniture, woolen blankets, and packed meat. The city also has a very large general jobbing trade, as it is the center of a rich agricultural region. During the excitement over the discovery of gold in California, in 1849, the city was a prominent outfitting and starting point for mining parties, and during the civil war it was fortified by the government. After the war, and particularly in 1880-90, its growth was rapid. Pop. '90, 52,324.

SAINT JOSEPH RIVER, rises in Hillsdale co., Michigan, flows into n. Indiana, thence to Michigan again, and after a general w. course of 250 m., discharges into lake Michigan at St. Joseph. It is navigable for 125 m. from its mouth.

SAINT JUST, LOUIS ANTOINE DE, a notable figure in the first French revolution, was b. at Decize, in Nivernais, Aug. 25, 1767; educated at Soissons by the Oratorians, and afterward went to Rheims to study law, but soon returned to his native village, where he devoted himself exclusively to literature. When the revolution broke out, Saint Just was transported with enthusiasm, and became one of its most ardent apostles. Probably no man in France was a more genuine fanatical believer in the brilliant delusions of the period. Spotless, even austere, in his morals, reserved in manner but eloquent in speech, and rigorously earnest in his convictions, he rapidly rose into consideration among the inhabitants of his native commune, who elected him lieut. col. of the national guard, sent to Paris in 1790 to assist at the fête of the federation. In 1791 appeared his *Esprit de la Révolution et de la Constitution de la France*, in which the various causes of the revolution are sketched in a calm, keen, precise sort of way; and in the following year he was chosen deputy to the convention by the electors of Aisne. Saint Just entered Paris on Sept. 18, 15 days after the frightful massacres which Lamartine in his *Histoire des Girondins* with melodramatic inaccuracy represents him as ordering in conjunction with Robespierre! He voted for the death of the king, and in an oration full of stern but exaggerated republican sentiment, gave his "reasons." It was this speech that made him famous and influential. The Girondins tried to win him over, but in vain. In all the fierce debates of this period, Saint Just took a leading part; but he also displayed a great capacity for administrative organization, and on Feb. 11, 1793, carried

his project for the formation of a committee to superintend the war. After the fall of the Girondins in June (Saint Just took no part in their overthrow, and never once spoke during the disastrous struggle between the two sections), the civil war broke out, and it is from this point that we date the exhibition of that intense and merciless republicanism which fitted him so well to be the associate of Robespierre. It is commonly thought that Saint Just—perhaps because he was so young—was merely an instrument in the hands of Robespierre; but the known facts of his career lead to a very different conclusion, and some writers have not scrupled to make Saint Just the real head of the extreme party who exercised government in France during the *reign of terror*. Almost all the energetic, or, as some would prefer to say, sanguinary measures drawn up to repress the royalists and timid republicans at home, and to repel the forces of the allied monarchs on the frontier, were devised by him. On Feb. 19 he was elected president of the convention. He drew up the terrible report which led to the arrestment and execution of Hebert, Danton, and their adherents. Saint Just had no scruples in cutting off his opponents. The intensity of his convictions rendered him indifferent to deeds of cruelty, however appalling. When the political reaction set in, and the party of moderation had got the upper hand in the convention, Robespierre and Saint Just were seized and imprisoned (July 27, 1794), and ordered to be guillotined next day. Saint Just suffered with sullen calmness—not a word escaping his lips. See Ern. Hamel's *Histoire de Saint Just* (Paris, 1859).

SAINT KILDA, a small island lying off the w. coast of Scotland, in lat. 57° 49' 20" n., 50 m. w. of the peninsula of Harris, to the parish of which it is reckoned as belonging. It presents bold and lofty precipices to the sea, except at two points, one on the s.e., the other on the w. side of the island. At each of these points there is a bay with a low shore. Besides the main island, there are several small islets, and the whole group has an area of from 3,000 to 4,000 square acres. Pop. '81, 77. Situated in the midst of the gulf stream, St. Kilda enjoys a mild climate, although the weather is often boisterous. On the main island there are some black cattle, and a large number of sheep (among which is a Spanish breed, whose wool is highly prized) are grazed on it and on the surrounding islets. Immense numbers of wild-fowl are killed annually, the flesh of which is very generally eaten and the feathers sold. The sea abounds in delicious fish, easily caught from the rocky shore without the use of boats. The inhabitants formerly were able to export more or less grain annually; but although the population has decreased within late years, they now consume all the cereal produce of the island, besides an additional quantity which they import. The present inhabitants habitually consume much more farinaceous food than their forefathers did. They do not receive any gratuitous assistance from the proprietor. The principal exports are kelt or rough woollen cloth, blankets, feathers, fulmar-oil, salted ling, young cattle, cheese, and tallow. See Seton's *St. Kilda* (1877); Connell, *St. Kilda and the St. Kildians* (London, 1887).

SAINT LANDRY, a parish in s.w. Louisiana, lying w. of Atchafalaya bayou, and drained by Teche, Nezpique, and Courtableau bayous; 1700 sq. m.; pop. '90, 40,250, chiefly of American birth, includ. colored. The surface is low and swampy, but the soil is very rich; cotton, corn, sugar-cane, and pork are the staples. Co. seat Opelousas.

SAINT LAWRENCE, a co. in n. New York, having the river St. Lawrence for its n. and n.w. boundary; 2926 sq. m.; pop. '90, 85,048, chiefly of American birth, with colored. It is intersected by the Rome, Watertown and Ogdensburg, and the Central Vermont railroads. It is drained by the Indian, Grass, Oswegatchie, Raquette, St. Regis, and Deer rivers, also by 3 large lakes, Long, Black, and Cranberry, and little ponds and streams. The surface is generally even, especially the banks of the St. Lawrence river, which for miles spread into level, fertile plains. It is thinly populated in the s.e., where a large portion is covered with pine, oak, and birch forests, and groves of sugar-maple, elm, and beech. Its soil is very fertile, yielding large crops of grain, potatoes, and wool, and is adapted to stock-raising and dairy products. Large quantities of honey and maple sugar are produced, and it has an active trade in lumber. Its mineral products are granite, iron ore, lead, limestone, and sandstone used for building purposes. The leading industries are the manufacture of agricultural implements, brick, carriages and wagons, cheese, iron castings, metallic wares, etc. Co. seat, Canton.

SAINT LAWRENCE, GULF OF, a western inlet of the northern Atlantic, washes at once all the British provinces, properly so-called, of North America—Newfoundland, Canada, New Brunswick, Nova Scotia, and Prince Edward's Island. It has three communications with the ocean—the strait of Belleisle, between Newfoundland and Labrador; the gut of Canso, between the island of cape Breton and the peninsula of Nova Scotia; and a far wider passage than either, with the island of St. Paul in the middle, between cape Breton and Newfoundland; while in the opposite direction it narrows, at the w. end of Anticosti, into the estuary of the mighty river, to which, as far even as its sources, it has gradually extended its own name. Besides Anticosti, St. Paul's, and Prince Edward's, already mentioned, this arm of the sea contains very many clusters of islands, and, more particularly in its southern half, the Magdalens and the Birds; these islands being, one and all, rendered more dangerous to shipping by the thickness of the fogs and the uncertainty of the currents. The gulf of St. Lawrence is celebrated for the productiveness of its fisheries; but perhaps it is best known as a

channel of traffic connecting, as it does, the busiest thoroughfares of maritime trade with one of the most extensive systems of inland navigation in the world.

SAINT LAWRENCE RIVER constitutes by far the largest body of fresh water in the world. Including the lakes and streams, which it comprises in its widest acceptation, it covers, according to the lowest estimate, fully 73,000 sq.m.; and as nearly the whole of this area averages considerably more than 600 ft. in depth, the aggregate cannot represent less than 9,000 solid miles—a mass of water which would take upward of 40 years to pour over the falls of Niagara, at the computed rate of a million cubic feet in a second. The river drains an estimated area of 335,515 sq. miles, of which 90,000 are covered by the waters of the great lakes.

This mighty artery of north-east America rises, under the name of the St. Louis, on the spacious plateau which sends forth also the Mississippi toward the gulf of Mexico, and the Red River of the North toward Hudson's bay—all three being said, in wet seasons, occasionally to mingle their floods. Lake Superior, the next link in the chain, finds its way to lake Huron through the rapid of St. Mary, which has been overcome by ship canals on the American and Canadian sides. Below lake Huron, which receives lake Michigan from the s., the river St. Clair, lake St. Clair, the river Detroit, and lake Erie maintain pretty nearly the same level, till the river Niagara descends 334 ft. to lake Ontario, which is itself still 230 ft. above sea-level. From this, the last of the connected series of inland seas, issues the St. Lawrence proper, which, with a few comparatively insignificant expansions, presents the character first of a river, and then of an estuary, down to the gulf. Between lake Ontario and the city of Montreal, which marks the head of the navigation, there are various cataracts or rapids, which, besides having been gradually ascertained to be more or less practicable, may be all avoided by means of canals on the British side. At about two-thirds of the distance from lake Ontario to the city of Montreal, the intersection of the parallel of 45° determines the point where the St. Lawrence, after having been an international boundary from the head, or nearly so, of lake Superior, becomes exclusively Canadian. Immediately above the island of Montreal, the St. Lawrence is joined by its principal auxiliary, the Ottawa, from the n.w.; and a little more than half-way between this confluence and Three rivers, the highest point of tidal influence, the Richelieu or Sorel, from the s., brings in the tribute of lake Champlain. Between Montreal and Quebec the St. Lawrence has recently been much deepened (see MONTREAL). At Quebec, after a run of nearly 400 m. from lake Ontario, it steadily widens into an estuary of about the same length. The entire length, including the chain of lakes, is about 2,200 miles.

In connection with the improvements on itself and its affluents, the St. Lawrence offers to sea-going ships the noblest system of inland navigation in the world, embracing a continuous line of about 2,000 m.; its advantages, however, are materially impaired by the severity of the climate, which binds it in the chains of winter at least five months in the year.

SAINT LEONARDS, EDWARD BURTENSHAW SUGDEN, Baron, 1781-1875; b. London; called to the bar in 1807. He restricted himself to chancery practice after 1817, and was made king's counsel in 1822. He was returned to parliament in 1828, made solicitor-general in 1829, and lord chancellor of Ireland in 1835, and 1841-46. He was lord chancellor of England in 1852, and was raised to the peerage. He published several valuable legal treatises—*Law of Vendors and Purchasers* (1805); and *Practical Treatise on Powers* (1808).

SAINT LÔ, an old t. of France, capital of the department of Manche, built on a rocky elevation on the right bank of the river Vire, 45 m. s.s.w. of Toulouse. From the high central part, several streets, more or less steep, branch off in different directions. The town, which is said to owe its origin and its name to a St. Lô, bishop of Coutances, who caused a church to be built here in the 6th c., was destroyed by the Normans in 888, and taken by the English in 1346, and again in 1417. Noteworthy are the beautiful churches of Sainte-Croix, founded in 805, and of Notre-Dame, which dates from the 15th century. Flannels, drill and cotton fabrics, and paper are manufactured, and a considerable supply of horses for cavalry are here obtained. Pop. '91, 11,445.

SAINT LOUIS, a co. in n.e. Minnesota, bounded on the n. by Namekan river and lake, and on the s.e. by lake Superior, drained by the St. Louis, Vermilion, Cloquet, and other rivers; traversed by many important lines of railroad; about 5860 sq. m.; pop. '90, 44,862, chiefly of American birth. The surface is uneven, heavily timbered, with several lakes. The soil is partly fertile, and grows wheat, corn, etc. Much lumber is exported. Co. seat, Duluth.

SAINT LOUIS, a co. in e. Missouri, bounded by the Missouri river on the n. and n. w., and by the Mississippi and St. Louis city on the e.; drained by the Meramec; between fifteen and twenty railroads traverse the co.; 492 sq.m.; pop. '90, 36,307, chiefly of American birth. The soil is fertile; all ordinary agricultural products are found. There are several kinds of building limestone, and mines of bituminous coal; there are also extensive manufactures of bricks, beer, tobacco, iron, and many other articles. Co. seat, Clayton.

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ST. LOUIS

REFERENCES.

HOTELS.

1. Hotel Barnum, K. 8 6. Hurst, K. 9
3. Hotel Beers, F. 7 7. Laclede, K. 9
4. G'd Ave. Hotel, F 7 8. Lindell, K. 8
Hotel Meyer, V. 2 11. Southern, K. 9

PROMINENT BUILDINGS AND

INSTITUTIONS.

2. American Central Bld'g, K. 8
3. Bank of Commerce Building, K.
4. Boatman's Bank Building, K. 8
5. Chamber of Commerce, K. 9
6. City Hall (New), J. 9

Railroads

Start Can Time

UNION DEPT. H. 8,

- Bank, & Ohio S. W. Ry.,
Chicago & Alton R. R.,
Chi. Bur. & Quincy R.,
Chi. & St. L. R.,
Chi. & St. R. Y.,
Illinois Central R. R.,
Louisville & Nashville R. R.,
Lynch, Eraser & S. L. R. R.,
Mo. Kan. & Tex. R. Y.,
N. O. & N. Y. R.,
Mobile & Ohio R. R.,
St. L. & Hannibal R. R.,
St. L. & San Fran. R. Y.,
St. L. Alton & Tex. R. R.,
St. L. & Vicksburg R. R.,
St. L. & Wash. R. R.,
St. L. Iron Mt. & Sou. R. Y.,
St. L. Kan. & Col. R. R.,
St. L. Keo. & N. W. R. R.,
St. L. & North Des. R. Y.,
St. L. & Rock. Is. R. R.,
St. L. & San Fran. R. Y.,
Tol. St. L. & Kan. Cy. R. R.,
Vandalia Line,
Wabash R. R.

First Building, A
CHURCHES.

- CHURCHES.
0. Baptist, G. 8
 1. Catholic, K. 9
 2. Christ (Episcopal), J. 8
 3. Church of the Messiah, G. 8
 4. First Presbyterian, D. 6
 5. First Presbyterian, F. 7
 6. Grand Avenue Presbyterian, F. 7
 7. Jewish Temple, J. 8
 8. Pilgrim Congregational, G. 7
 9. St. Alphonsus, F. 6
 10. St. Peter and St. Paul, J. 11
 11. St. Xavier's, F. 7
 12. Second Presbyterian, J. 8
 13. Temple Israel, G. 8
 14. Union Methodist, G. 7

PLACES OF AMISEMENT

3. Germania Theatre, J. 8.
9. Fair Grounds and Zoo Garden, G. 4.
10. Grand Opera House, K. 9
11. Hagan's Opera House, K. 8
2. Pope's Theatre, K. 8
3. Olympic Theatre, K. 9
4. Havin's Theatre, K. 9
5. Shaw's Garden, C. 10
Standard Theatre, K. 9





A B C D E F G H J K L
8 9 10 11 12 13 14

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ST. LOUIS, port of entry and commercial metropolis of the Mississippi valley, chief city of Missouri and fifth in the United States in population, is situated on the west bank of the Mississippi river, about 20 miles below its confluence with the Missouri, and 175 miles above the influx of the Ohio, in latitude $38^{\circ} 37' 27''$ north, and longitude $90^{\circ} 15' 16''$ west. It is distant about 1170 miles from New Orleans and 729 from St. Paul. The city has a frontage of 20 miles on the river, from which it rises in three terraces (the third, known as Côte Brillante, being 200 feet above the level) and has an area, including suburbs, of $61\frac{1}{2}$ square miles. The elevation above the sea is 480 feet. The mean temperature in summer is 76.12° ; in winter, 32.90° .

HISTORY.—In 1764 a fur-trading station was established here by Auguste Chouteau, under orders from Pierre Liguist Laclède, as a headquarters for the large French firm of Maxent, Laclède et Cie., and was named in honor of the pious ancestor of Louis XV. Several small trading-posts had been established in this region before, but the general knowledge of the character and resources of the country was still very meagre. Louis XV. had just ceded the territory east of the Mississippi to England, and at the same time, by secret treaty, had transferred the west to Spain. Spanish authority was not enforced, however, until 1770, when Don Pedro Piernas took formal possession of the place with a small body of troops. St. Louis had been made the capital of Upper Louisiana in 1765, although it scarcely numbered 50 families. In 1798 Spain ceded Louisiana back to France, and on Mar. 9, 1803, France ceded the entire territory to the United States for the consideration of \$15,000,000. The English-speaking population soon began to increase largely. In 1808 the first newspaper was established, and on Mar. 9, 1809, St. Louis became an incorporated town. On Aug. 2, 1817, the first steamboat appeared on the river. John Jacob Astor opened the western branch of his fur trade here in 1819, and in a short time the annual shipment of furs was valued at \$200,000. St. Louis was made a chartered city Dec. 9, 1822, but its real growth and prosperity date from a period fully 10 years later, although it suffered materially from the panic of 1837, and from cholera and fire in 1849. During the civil war also the commercial advancement of the city was seriously retarded, as its sympathies were largely with the South.

GENERAL DESCRIPTION.—From the altitude of the third terrace, St. Louis extends westward in an undulating plain. The streets are laid out regularly on the plan of Philadelphia. Market street, running east and west, is the dividing line for north and south, where the streets are designated by numbers. The trade section is mostly in the older part of the city, where the streets are usually narrow, with the exception of the Levee, or Front st., which is 100 feet wide. The modern section is laid out regularly, and in the residence portion a large percentage of the houses are detached. Streets extending parallel to the river are numbered north and south from Market st., while those at right angles to it are numbered from the Levee. The prominent retail stores and emporiums are situated on Fifth st. (Broadway) and Olive st.; the wholesale establishments, insurance, banking, and commission offices, on Wabash avenue and First, Second, and Third streets. The section devoted to the finer residences is north of Chestnut st. and west of Grand ave. The most beautiful driveways are St. Louis and Lindell boulevards, leading to Forest park. There are 350 miles of well-paved streets,—granite, asphalt, wood, and macadam pavement being variously used. There are numerous lines of street railroad, operating over 250 miles of track by the electric and cable systems.

The public parks of St. Louis constitute one of its most attractive features. The total area (2,268 acres) is exceeded only by Philadelphia. With commendable foresight, too, many of the more spacious squares were long ago destined to afford shelter and recreation for the people in the very midst of the city. Forest Park, which extends for $4\frac{1}{2}$ miles from the Court house and covers 1870 acres, is the largest and perhaps the handsomest of the greater parks, although the land is unimproved to a great extent. Tower Grove park (276 acres), in the southwest part of the city, was the gift of Henry Shaw, who also donated the still more beautiful Missouri botanical garden, which is conceded to be the finest of its kind in the United States. Lafayette and Carondelet parks exemplify, in their way, the possibilities of loveliness within a small space. The Fair grounds (137 acres) have a fine one-mile race-track, besides numerous halls, etc., for the various exhibits, and an amphitheater seating 40,000 people. The annual fair, which takes place here during the first week in October, is also the occasion of the famous torchlight procession of the Veiled Prophet. Bellefontaine and Calvary cemeteries have been laid out with excellent taste, and are frequently visited by strangers. The favorite pleasure resorts within convenient access are Montesano, Kirkwood, Crystal City, Crève Cœur lake, and Florissant. The beer gardens, always cool and inviting, are liberally patronized by Americans as well as Germans.

Among the handsomer and more imposing public buildings are the new City hall in Washington Park, cost \$2,000,000, and the Court house occupying the entire square bounded by Broadway, Fourth, Chestnut, and Market streets. The latter pile is in the form of a Greek cross, and is crowned by a dome 300 feet high, embellished with frescoes by Weimar (a St. Louis artist who died in 1863). The so-called Four Courts on Clark ave., containing the police headquarters, criminal courts, etc., was planned after the Louvre in Paris. The colossal Post-Office and Custom House, on Eighth St., cost more than \$6,500,000. There are also many superb structures in St. Louis erected within re-

cent years through the combination of public and private munificence, such as the Mercantile library, on Broadway, and the Public library, the several buildings comprising Washington university, the museum of fine arts, and the chamber of commerce. In the business section, "sky-scrapers," like the Union Trust, Rialto, Columbia, Turner, Laclede, and Equitable buildings, are very conspicuous, while elsewhere will be noticed the new High school, Mercantile club, St. Nicholas hotel, and the splendid new Planter's hotel. The Chamber of Commerce building cost \$2,000,000. The magnificent Union railroad station, opened in 1894, is the largest in the world, and involved an expenditure of \$4,000,000. The most beautiful church edifices are the Roman Catholic cathedral, Christ Church cathedral, Grand Ave. Presbyterian church, and the Jewish temple. The Grand opera house and the Olympic, Pope's, Havlin's, and Standard theaters likewise contribute to the city's architectural adornment.

The stupendous structure known as the St. Louis bridge, designed by Captain J. B. Eads in 1868, was completed in 1874. It consists of three steel spans (the center one of 520 feet, the others of 500 feet each), resting on limestone piers carried down to the solid rock. The roadway, including accommodations for foot passengers, is 54 feet wide, and below this are two lines of rail. The cost of the bridge and the 4,800 ft. tunnel, extending to Poplar and 8th street, was over \$10,000,000. The Merchants' bridge, three miles further up the river, was built in 1889-90 at a cost of \$3,000,000. This also has three spans of about 500 feet each, and is used solely for railway traffic. The Grand avenue bridge is a suspension structure across the railroad tracks.

TRADE AND INDUSTRIES.—The incomparable position of St. Louis in the center of the vast and fertile Mississippi valley gives it enormous advantages for trading purposes, and consequently this inland metropolis is one of the most thriving commercial cities of the Union. The U. S. census of 1890 reported for St. Louis, 6148 manufacturing establishments, employing \$141,872,386 capital and 94,051 persons, paying \$53,394,630 for wages and \$122,216,570 for materials, and having a combined output valued at \$229,157,343. The most important manufactures were malt liquors, output, \$16,185,000; tobacco, \$15,913,000; flour and grist mill products, \$12,456,000; foundry and machine shop products, \$11,945,000; packed meat, \$8,562,000; and boots and shoes, \$4,250,000. There are likewise large manufactures of beer, hardware, clothing, dry goods, stoves, railway and street cars, wooden-ware, bricks, drugs, crackers, etc. The city has an unrivaled trade in lumber, grain, fur, hides, breadstuffs, provisions, manufactured articles, agricultural productions, and general jobbing commodities. It is not only a great distributing point, but it is a great market for all human necessities. Its shipments of cotton, live stock, the various cereals, and dressed meats have an enormous annual volume that is steadily enlarging.

RAILROADS.—An adequate conception of the extent and possibilities of its interstate commerce may be had by considering the great area of country that is made tributary to it by the railroads. Among the systems are the Baltimore and Ohio Southwestern, the Burlington Route, the Chicago and Alton, the Chicago, Peoria, and St. Louis, the Cleveland, Cincinnati, Chicago, and St. Louis, the Illinois Central, the Louisville and Nashville, the Missouri, Kansas, and Texas, the Missouri Pacific, the Mobile and Ohio, the St. Louis and San Francisco, the St. Louis, Chicago, and St. Paul, the St. Louis, Kansas City, and Colorado, the St. Louis, Peoria, and Northern, the Vandalia lines, the Wabash lines, the St. Louis, Iron Mountain, and Southern, the Louisville, Evansville, and St. Louis, and the Toledo, St. Louis, and Kansas City. The city is also in direct communication with over 6,000 miles of navigable rivers.

COMMERCE.—A large part of the foreign trade is entered and cleared at the port of New Orleans. The city is an interior port of delivery, to which merchandise can be transported without appraisement at the port of entry; and the value of foreign merchandise imported during the fiscal year 1896-97 aggregated over \$2,500,000. The domestic trade by rail and water is many times larger.

BANKS.—In 1896 there were 8 national banks in operation, with capital of \$9,400,000, holding \$1,002,000 in U. S. bonds beyond the legal requirement, having deposits of \$23,646,694, and a reserve of \$6,137,564. The exchanges at the clearing house in the year ending Sept. 30, 1896, aggregated \$1,182,015,146, a decrease of over \$36,000,000 from the total of the previous year.

EDUCATION, ETC.—There are over 120 buildings used for public school purposes; public school property valued at over \$4,250,000; public school population, about 159,000; enrollment in public schools, over 70,000, and in private schools, 25,000; annual expenditure for public education, over \$1,600,000. There is a fine central high school, and numerous private and denominational secondary institutions. Washington and St. Louis universities and the Christian Brothers' college are the principal collegiate institutions. The former comprises (without reference to its preparatory, technical, and training schools) separate academic, law, and medical departments, and in 1896 had over 1,800 students in all departments. There are medical colleges, theological seminaries (Luth. and Ger. Evang.), dental college, a training school for nurses, the St. Louis school of fine arts, a manual training school, the state school for the blind, the St. Louis day school for deaf mutes, and a deaf mute institute connected with the Maria Consilia convent.

In 1896 there were 23 libraries in the city, containing 1,000 volumes and upward each, of which the Public (109,663), the Mercantile (94,843), St. Louis university (31,325), the Law (25,000), and Kenrick seminary (20,000) were the largest.

St. Louis had 263 church edifices in 1890, representing 289 religious organizations. The church membership was reported at 131,186, and the value of all church property, \$5,876,960. The city is the seat of a Roman Catholic archbishop, and of a Protestant Episcopal bishop.

GOVERNMENT, ETC.—The government of the city is vested in the mayor (elected for four years, with salary of \$5000), a municipal assembly, and a board of public improvement. The assembly is composed of a council of 13 members, elected on a general ticket, and a house of delegates, elected from each one of the 28 wards. The judiciary comprises the supreme court of Missouri, the St. Louis court of appeals, a probate court, circuit court, criminal, correction and police courts, and 14 justices of the peace. Among public institutions are several hospitals, an insane asylum, poor-house, workhouse, house of refuge, morgue, and markets.

The city has a bonded debt of \$21,000,000, including a water debt of over \$5,500,000, and an assessed real and personal property valuation of about \$324,500,000. It derives a handsome revenue from water rates and permits, the collections exceeding all fixed charges against the system. Pop. '90, 451,770.

SAINT LOUIS, the capital of the French possessions in Senegambia, is situated on a small low island of the same name, at the mouth of Senegal river. The town covers almost the whole island. Some trade in textiles, arms, rice and building materials is carried on. Pop. '89, 19,413.

SAINT LUCIA, one of the Windward division of the Caribbees (see ANTILLES), lies about 30 m. to the s. of Martinique, having its southern extremity in lat 13° 41' n., and long. 61° west. The island is of volcanic origin, and the crater of the *Soufrière*, or *Sulphur mountain*, is still in energetic operation. Saint Lucia is remarkable for its picturesque and romantic scenery. Much of the surface is covered with hills, generally well wooded, and occasionally rising to the height of nearly 3000 feet. Area, 237 sq. m. Pop. '92, 43,310, few of whom were whites. As the coast abounds in secure, commodious, and defensible harbors—all the more valuable from their comparative scarcity in the neighborhood—the island has been, perhaps to an unexampled extent, an object of contention between France and England. In the hands of the latter, however, it has remained since 1803. The capital, Castries, had, 1890, a pop. of 8,000. The chief articles exported are sugar, tobacco, cacao, and logwood. The harbor of Castries is one of the best in the West Indies.

SAINT LUCIE BARK. See CARIBBEE BARK.

SAINT MALO, a fortified seaport of France, in the dep. of Ile-et-Vilaine, at the mouth of the river Rance. It stands on a small island less than three miles in circumference, called *Le Rocher d'Aaron*, which lies close off shore, and is connected with it by a causeway, 650 feet long, called *Le Sillon*. The principal manufactures are naval articles and lace. The exports are potatoes, buckwheat, barley, butter, eggs, blackberries, essence of chestnut, and mistletoe; the imports coal, timber, and iron. The harbor is dry at low tide. The town is a popular bathing resort. It contains a museum of natural history and an old cathedral. Pop. '91, commune, 11,896.

SAINT MARC GIRARDIN. See GIRARDIN, SAINT MARC.

SAINT MARTIN, one of the Lesser Antilles, West India islands. It belongs partly to France, and partly to the Netherlands. Area, about 38 sq. miles. The climate is healthy, but water is scarce at times. Slavery was abolished in 1863. Pop. '91, 3641.

SAINT MARTIN, ALEXIS. See BEAUMONT, WILLIAM.

SAINT MARTIN. See PATRON SAINTS.

SAINT MARTIN, a parish in s. Louisiana; bounded on the s. by lake Chetimaches; drained by Atchafalaya and Teche bayous; about 620 sq. m.; pop. '90, 14,884. Co. seat, St. Martinville.

SAINT MARY AND ALL SAINTS, LINCOLN, commonly called LINCOLN COLLEGE, Oxford, was founded for a rector and seven fellows, in 1427, by Richard Fleming, bishop of Lincoln. In 1475 Thomas Scot, commonly called Rotherham, from the place of his birth, then bishop of Lincoln, afterward archbishop of York, finished the building, added five fellowships, and gave statutes to the society. The object of both founders was to extirpate the Wycliffite heresy, by training up theologians for that purpose. The fellowships were restricted to the dioceses of Lincoln, York, and Wells. By the ordinances under 17 and 18 Vict. c. 81, they are thrown open, the rector and fellows are empowered to reduce the number to ten, as vacancies occur, should this seem expedient, and their value is not to exceed £300. Various benefactors have bestowed scholarships on the college to the number of 24. By the ordinances, 16 of these are thrown open, of about £80 per annum, and tenable for 16 years from matriculation, which

may be extended to 20 if the rector and fellows think fit. This college presents to 10 benefices.

SAINT MARY HALL, Oxford. In 1239 Henry Kelve, a citizen of Oxford, presented a tenement, on the site of the present St. Mary hall, to the rector of St. Mary's church, to be the parsonage house. In 1335 Edward II. gave the church, together with the parsonage, to Oriel college. The college converted the parsonage into a place of education, and it gradually grew into an independent hall. It possesses 4 scholarships of £60 per annum, tenable for four years, and 1 exhibition.

SAINT MARY, a parish in s. Louisiana, having the gulf of Mexico on the s. and s.e., Chetimaches lake on n. and n.e., Atchafalaya bayou on the e., the waters of the gulf forming Côte Blanche bay and Atchafalaya bay in the s. and s.w.; 640 sq. m.; pop. '90, 22,416, chiefly of American birth, includ. colored. It is intersected by the navigable bayou Teche, and also drained by the Atchafalaya. Its surface is low and marshy, and subject to overflow, but in the arable portions having a fertile soil. In the marshes are forests of live-oak, with a thick undergrowth of cypress, gum, etc., and the soil produces large crops of grain, sweet potatoes, and sugar-cane. The principal industries are the manufacture of cooperage, bricks, sugar, and molasses. Co. seat, Franklin.

SAINT MARY, a co. in s. Maryland, bounded on the e. by Chesapeake bay, on the n.e. by the Patuxent river, and on the s.w. by the Potomac; about 360 sq.m.; pop. '90, 15,819, chiefly of American birth. The surface is level and heavily timbered. The soil is fertile. Principal productions are corn, wheat, and tobacco. Co. seat, Leonardtown.

SAINT MARY'S, an incorporated town in Perth co., Ontario, Canada; 20 miles n. of London, 98½ m. s.w. of Toronto, at the junction of the London branch with the Grand Trunk railway; pop. '91, 3,416. It is pleasantly situated on the river Thames, and is substantially built. Limestone is found in great abundance in the vicinity, and quarried for building purposes. It has churches, bank agencies, newspapers, several hotels, and railway viaducts. It has an active trade in grain, and the principal industries are represented by manufactures of iron castings, agricultural implements, lumber, woolen goods, leather, etc.

SAINT MARY'S, an island belonging to Great Britain, situated at the mouth of the Gambia, in western Africa.

SAINT MARY'S STRAIT, or **RIVER**, the outlet of lake Superior, runs from the e. end of the lake, takes a general s.e. course, and is about 60 m. in length, entering lake Huron by several channels. It forms the boundary between upper Michigan and the province of Ontario, Canada. Ship canals have been constructed on both sides of the strait by the U. S. and Canadian governments, at great expense, and the annual traffic exceeds in weight that of the Suez canal.

SAINT MAURICE, a co. in s. Quebec, Dominion of Canada, having lake St. Peter on the s., and the river St. Maurice for its s.e. boundary; 7300 sq. m.; pop. '91, 12,267. It is intersected by the Canadian Pacific and the Three Rivers branch of the Grand Trunk railway, forming a junction at its co. seat. The surface is level and largely covered with forests, which supply lumber for an important trade. It is drained by Black Beaver lake and other small lakes and streams, and the soil is fertile. Its manufacturing interests are of great importance, principally the manufacture and sale of lumber and iron, the immense forges at its co. seat having a wide reputation. Co. seat, Three Rivers.

SAINT MAURICE RIVER, in central Quebec, Dominion of Canada, 400 m. long, rising in lake Oskelanaio, forming the connecting link to a chain of lakes, and descending through the n. wilderness and the co. of Champlain, enters the St. Lawrence river at the city of Three Rivers, 9 m. above lake St. Peter. Its source is 216 m. n.w. of Montreal. Its drainage area is 16,000 sq. m., the length of its valley is about 223 m., width 140 miles. Its banks present magnificent scenery, sometimes rising to the height of from 200 to 1,000 feet. In its course it has many branches, expands into lakes containing small picturesque islands, and descends in falls and cascades, the most remarkable of which are the falls of Grande Mère, and those of Shawnegan, 22 m. above its mouth, 160 ft. in height. It is navigable near its mouth, and after an interruption of 40 m. is again navigable for 75 miles. The climate is too cold for the production of grain, but it affords transportation for an extensive lumber region, in which 500,000 logs are cut annually. It is crossed by two bridges, 1400 and 600 ft. in length.

SAINT MICHAEL'S, the largest and most important of the Azores (q.v.), and, with the exception of St. Mary's, the most eastern island in the group. Area, 300 sq. m.; pop. about 125,000. The island is mountainous, and rises in its highest summit to 3,560 feet. There are many hot springs. The exports are fruit and wine. The chief town is Ponta Delgada. Pop. '90, 16,767.

SAINT MICHAEL'S MOUNT, a conical and isolated rock in Mount's bay, Cornwall,

18 m. w. of Falmouth. It communicates with the shore by a causeway 400 yards long which, however, is covered with water 8 hours out of the 12. The mount is 230 ft. high, is about one mile in circumference, and is crowned by an old and picturesque castle—now used as a manorial residence—surmounted by a tower, on one angle of which there is a projecting stone lantern, popularly called *St. Michael's chair*. At the base of the mount is a small fishing village. This hill is to the geologist one of the most curious of localities, and, indeed, it is said to have "excited more geological controversy than any mountain of the world." At a very early period Saint Michael's mount was the seat of a religious house, and the apparition of St. Michael is said to have appeared on one of its craggy heights. At the conquest the monastery of St. Michael was annexed to the abbey of St. Michael in Normandy. It long remained in the possession of the monks, and afterward became the residence of several families in turn, until it was sold in 1660 to its present proprietors, the *St. Aubyns*. Pop. '91, 81.

SAINT MICHEL, MONT, an extraordinary rock in Cancale bay, in the n.w. of France, 6 m. s.w. of Avranches. It is a solitary cone of granite, 2 m. in circumference at the base, and rising to the height of 233 feet. It rises sheer out of a level expanse of sand, and, though its elevation is not great, its perfectly flat environment and its pointed crest render it a most striking feature in the landscape. It is crowned by a church and castle, under which are conventual buildings, with their lofty turrets and high walls, and lower down still are the houses of the small town, which seem to adhere to the steep rock like limpets. Pop. '91, 199.

SAINT NAZAIRE, a thriving seaport of France, in the dep. of Loire-Inférieure, at the mouth or estuary of the Loire, on the n. bank of that river, and 31 m. n.w. of Nantes, with which it is connected by railway. Almost unknown till within recent years, it is now one of the most important ports on the w. coast of France. In 1851 it contained 2391, in 1861 6500, and in 1896, 30,813 inhabitants. Here the government has constructed two floating docks, the Bassin de St. Nazaire and the Bassin de Penhouet. St. Nazaire is the port for the transatlantic steamers to the West Indies and Mexico. One cause of the rapid rise of this port is that the navigation of the Loire is becoming year by year more difficult, owing to the sand brought down by the river.

SAINT NICOLAS, a flourishing manufacturing and market t. of Belgium, in e. Flanders, 13 m. s.w. of Antwerp, on the Ghent and Antwerp railway. It stands in the midst of the Pays de Waes, a densely peopled and productive agricultural district, and manufactures woolen and cotton goods, pins, lace, hosiery, etc. The market is held in the great square of the town, one of the largest in Belgium, but which, however, is too small to accommodate comfortably the immense numbers who crowd hither on market days. St. Nicolas is a manufacturing town of the first class. Pop. '95, 29,088.

SAINT OMER, a t. and fortress of France, capital of the department of Pas-de-Calais, on the Aa, 22 m. s.e. of Calais by railway. It is surrounded by irregular but well-appointed fortifications, is well built amid marshes, and contains numerous fountains, and more than one important ecclesiastical edifice. Woolen cloths, blankets, pottery, and clay pipes are manufactured, and there are distilleries, soap works, and sugar refineries. Pop. '91, 21,161. A college for the education of English and Irish Catholics was opened at St. Omer during the penal times. It was closed, however, during the revolution.

SAINTON-DOLBY, CHARLOTTE HELEN, 1821-1885; b. and d. London; studied at the royal acad. of music under Cruvelli. From her *début* in 1841 to her retirement, 1870, she was considered the leading oratorio and ballad singer in England, possessing a contralto voice of marvelous strength and beauty. She married the celebrated violinist, Prosper Sainton, 1860. Among the many cantatas composed by her, perhaps the best known is "The Story of a Faithful Soul," which was produced in London, 1879.

SAINT PANCRAS, one of the northern suburbs of London (q. v.).

ST. PAUL, city, capital of Minnesota, and co. seat of Ramsey co.; on the Mississippi river, and the Chicago, Milwaukee, and St. Paul, the Chicago, St. Paul, Minneapolis and Omaha, the Great Northern, the Northern Pacific, and several other railroads, 410 miles n.w. of Chicago. The first settlement was made in 1838 by a French Canadian. In 1841 Father Gaultier, a French Catholic priest, established a little log church in the wilderness and devoted it to St. Paul, whence the name of the city. The township was located in 1847, and a city government obtained in 1854; the suburb of West St. Paul was added in 1874, since which time the growth has been so rapid that the outposts join those of Minneapolis, and these two great commercial and manufacturing centers are called "The Twin Cities of the West."

The situation of St. Paul, 700 to 800 feet above the sea-level, upon a semicircle of hills which rise from 70 to 200 feet, in three plateaus on both sides of the river, enclosing the city on three sides, gives it a very commanding aspect. A system of parks and connecting boulevards adds to the natural beauty of the location. Como park has an area of over 350 acres, and there are many public squares and two fine cemeteries.

The state fair grounds and experimental farm are located here. The streets are largely paved with asphalt or cedar blocks; Summit avenue, the finest street, runs along a high ridge, from which a descent is made to the High bridge, which rises rapidly from the level bank on the northeast side to the bluff on the opposite shore, and joins the boulevards of St. Paul and Minneapolis. Cable and electric railways traverse the city and its picturesque suburbs. The Indian mounds at Dayton's Bluff, near the Mississippi, to the east, are relics from which a fine view of the city and river may be obtained. Carver's cave was named from the fact of a treaty being made here with the Indians, in 1767, by Captain Jonathan Carver.

Many of the public buildings are constructed of limestone quarried near the city. Among them are the Capitol, with the library of the state historical society; court house and city hall, costing \$1,000,000, with a public library; custom house and post office, New York life insurance, St. Paul's cathedral, Globe building, Metropolitan opera house, Grand opera house, Grand arcade, several railroad general office buildings, *Pioneer Press* building, and the Minnesota club building. There are many public school buildings, a high school, Hamline university (Meth. Epis.), Macalester college (Pres.), St. Thomas's and St. Paul's seminaries (R. C.), Concordia college (Luth.), St. Luke's, St. Joseph's, city and co., Bethesda, and Homeopathic hospitals, several orphan asylums, and more than 150 churches. There are several medical colleges, a state soldiers' home, and many daily, weekly, and monthly publications. The yearly mean temperature is 43.2°, and the death-rate is very low. An ice carnival is a source of amusement to the inhabitants every year; an immense palace is built with bastions, and turrets, and towers, all of ice, brilliantly illuminated by electricity. Tobogganing and walking about on snow-shoes afford much pleasure. The United States signal service station is located here, and St. Paul is the headquarters of the military department of Dakota. Water is brought from a number of lakes north of the city, and distributed by a high-service reservoir. An exhilarating climate and the general beauty of its situation and improvements have attracted and developed an enterprising and intelligent population. The U. S. census of 1890 reported for St. Paul, 1,442 manufacturing establishments, employing \$22,501,211 capital and 18,558 persons, paying \$10,373,396 for wages and \$15,867,573 for materials, and having a combined output valued at \$33,035,073. The leading industries are the manufacture of machinery, farm implements, brass goods, stoves, blank-books, ale and beer, bricks, furniture, clothing, carriages, boots and shoes, lumber, sashes, doors and blinds, etc. Among the attractions of the city and its vicinity, are Minnehaha falls, White Bear lake, Bald Eagle lake, lake Como, fort Snelling, and St. Anthony's falls and park. The waterworks are owned by the city, cost more than \$4,000,000, and yield a large revenue beyond charges. The total property valuation exceeds \$122,500,000, and the net debt is less than \$10,000,000. Pop. '90, 133,156.

SAINT PAUL DE LOANDA, a considerable seaport on the s.w. coast of Africa, the capital of the Portuguese settlement in Lower Guinea, stands at the mouth of the river Bengo, in lat. about 8° 54' south. It is the largest and most important European settlement on this coast, and contains 14,000 inhabitants, of whom 900 are white, 1100 mulattos, and 12,000 black. The climate is comparatively healthy, the harbor is beautiful, and protected by one large and two small forts. The houses are good, the streets unpaved, and there are churches and a hospital. Ivory, rubber, coffee, grain, palm and other vegetable oils, and bees-wax are the principal exports.

SAINT PAUL'S CATHEDRAL in London is noted from its being the largest and most magnificent Protestant church in the world, and second only to St. Peter's in Rome among the religious structures of modern times. The site of the present building was occupied about 610 by a Christian church dedicated to St. Paul. This church continued till 1083, when it was destroyed by fire. From its ruins arose a much more splendid edifice—the immediate precursor of the present cathedral. In 1137 the building suffered severely from fire; but, that being the great age for splendid churches, it was soon restored with great magnificence, the bishops and the people contributing most liberally to defray the cost. Old St. Paul's was the largest church in the country, being 690 ft. in length, 130 in breadth, and about 150 ft. high. The total height of the stone tower and the spire, covered with lead, which surmounted it, was 520 feet. The cloister was 90 ft. square, with a beautiful chapter-house in the center. In 1666 the great fire of London completely destroyed the old cathedral, along with a large portion of the city and most of the churches; and thereafter sir Christopher Wren was employed to design about 50 of the new churches, and, among others, the new cathedral. In 1673 he submitted several designs for a new cathedral to the king, who selected one, and ordered a model of it on a large scale to be prepared. This was done by Wren, and the model still exists. Its plan is in the form of a Greek cross, having a large dome over the center, supported on eight arches. This was, however, eventually departed from; and the new design was modeled on that of a Gothic cathedral, with an interior length of 460 ft., width 240 ft. across transepts, and a nave 94 ft. wide. The dome and the eight supporting arches of the model are preserved; but in the new design the angle arches lead to no spacious compartment, but to small dark passages only, while the upper portions of these great arches are blocked up with other arches, introduced for constructive purposes, but very destructive of the architectural effect. The plan of supporting the dome on eight arches had the charm of novelty, and also of simplicity of construction,

but it made the arches themselves too small in proportion to the great span of the dome. The constructive skill displayed by Wren in this building is universally acknowledged and admired, but it is thought that he has allowed the mechanical exigencies of the work to interfere too much with its decorative requirements. The dome, for example, is constructed on a new and most masterly principle, the thrust of the vault being counterbalanced by the weight of a brick cone, which is carried up to support the stone lantern over the exterior dome. But in order to carry this out with the least expenditure possible, the drum, or plain cylindrical wall under the dome, is sloped inward, so that the columns with which it is decorated appear to the spectator below to be falling inward, thus producing a painful and disagreeable effect. Great exception is taken to the fact that the external dome is of *wood*, and not of stone, and so liable to premature decay; but the same may be said of the wooden roofs over the vaults of Gothic cathedrals; and by making it of wood sir Christopher was enabled to raise it to a height which makes it one of the noblest buildings of the kind in the world. The design of the nave, from the classic vaulting with which it is covered, is necessarily to a great extent a failure. When domes, or intersecting vaults, are used in a classic building the compartments must be about square; there can therefore be but a small number of nave piers, as compared with those of a Gothic cathedral, and the perspective effect of the latter is thus entirely wanting. The same is the case at St. Peter's. The dome is particularly successful, and is admitted to be the finest in existence; no other being so graceful and varied in outline, and yet so massive in general effect. Its height from the pavement to the top of the cross is 404 feet. The w. front, as seen from Ludgate hill, is most striking; the two campaniles group most harmoniously with the dome, and, together with the portico, produce a most pleasing and remarkable effect. This front must, however, be condemned, along with the screen-walls, if strictly criticised. The upper portico *appears* to indicate an upper story where there is none, and the actual construction and true form of the building are not expressed at all. St. Paul's is the burial-place of many heroes and men of distinction, whose tombs are in the crypt, and whose monuments adorn the interior of the cathedral. Among these are Nelson and Wellington, Collingwood, Abercromby, Moore, Howe, St. Vincent, Picton, Rodney, and many other celebrated soldiers and sailors; Howard, Johnson, Reynolds, Barry, Opie, West, Astley Cooper, sir William Jones, sir Christopher Wren, and other distinguished civilians. Several of the monuments are by Flaxman, Chantrey, Bacon, and Rossi; but it must be confessed that they savor generally too much of heathen mythology to be appropriate in a Christian cathedral. See illus., *DOMES*, vol. V.

SAINT PETER, city and co. seat of Nicollet co., Minn.; on the Minnesota river and the Chicago and Northwestern, and the Chicago, St. Paul, Minneapolis, and Omaha railroads; 75 miles s.w. of St. Paul. It is the seat of the Gustavus Adolphus college (Luth.), and of the state hospital for the insane; has valuable timber land on its e. and rich prairies on its w.; and contains excellent limestone for building and burning, high school, college library, national and state banks, and manufactories of machinery, foundry products, and flour. Pop. '90, 3,671.

SAINT PETERSBURG, a maritime government of Russia, one of the Baltic provinces, between lake Ladoga on the n.e. and lake Peipus on the s.w. Area, 20,760 sq. m.; pop. '93, 1,869,752. Some agriculture and cattle breeding are carried on, and there are manufactures of cottons, silks, paper, ironware, and machinery. It is divided into the districts of St. Petersburg, Gdov, Luga, Novaya, Ladoga, Peterhof, Schlüsselburg, and Yamburg. The chief town is the capital, Saint Petersburg (q.v.).

SAINT PETERSBURG, the capital of the Russian empire and of the government of the same name, stands upon and around the lower branches of the Neva, and on the shores of the eastern extremity of the gulf of Finland, 16 m. e. of Cronstadt, its port. Lat. 60° n., long. 30° 19' e. The Great Neva, the most southern branch of the Neva, divides the city into two great sections—the Petersburg side on the n., and the Great side on the south. The former is built on the islands which are formed by the delta of the Neva, the chief of which are the Vassili Ostrov, the Citadel island, and the islands Aptekarskoi, Kammennoi, Petrovskoi, Krestovskoi, and Elaghinskoi. The Great side, s. of the Great Neva, is compactly built, and contains the residences of the court and of the nobility, and more than half the population. The city covers an area of 21,195 acres, of which 1,330 acres are under water, upon plains which were formerly malarious marshes, but are now for the most part drained and laid out in meadows and gardens. Pop. '97, 1,267,023.

The climate, severe in winter, is pleasant and mild in summer. The mean temperature in summer is 62°; in winter, 14° Fahr. The extremes of temperature are 99° and -51°. Fourteen arms of the Neva, irrespective of the smaller branches, ramify through St. Petersburg, and there are seven canals.

General View of St. Petersburg.—Approaching the city from Cronstadt (q.v.), the port and fortress of the Russian capital, the first indications of the great city are the gilded dome of the church of St. Izak, and the lofty spire of the admiralty, which are seen rising apparently from the water's edge. The Admiralty square faces the English quay on the s. bank of the Great Neva, and may be considered the center of the city. From

the spire, with its numerous galleries, the whole plan of the city can be clearly seen. Right opposite it is the populous Vassili Ostrov, on the s. shore of which are the Bourse, academy of sciences, corps of cadets, etc. To the n. is the Citadel island, and further n. the densely peopled Aptekarskoi island, and the Kammennoi, and other islands, which are for the most part studded with wood-embosomed villas, and laid out in charming gardens. Considering the river on the n. as the chord, and the admiralty as the center, the semicircle that might be drawn with a radius of $2\frac{1}{2}$ m. would pretty nearly describe what is called the Great side of St Petersburg. This section of the city is divided into three or four portions by the Moika, St Catharina, Fontanka, and New canals; and it is intersected by three spacious streets, which radiate e.s.e., s.e., and s. from the great center, the admiralty. The streets are named respectively the Nevski Prospekt (Neva Perspective), Gorokhovaia Oulitza (Peas street), Vosnosenskoï Prospekt (Resurrection Perspective). Extensive suburbs also are rising on the eastern bank of the Neva, and there are five railway stations.

Streets, Squares, Monuments, Bridges, Churches, etc.—The street architecture of St Petersburg, unlike that of Moscow, with its pale-yellow walls and red and green roofs, is almost destitute of color. Here the rigid, military aspect of the streets, with the houses drawn up in long regular lines of gray, or massed together in blocks like the squares of battalions, is one of the first features of the Russian capital that impress themselves upon a traveler. Except in the more fashionable quarters the greater number of the houses are built of wood; but owing to the liability of such houses to catch fire, building in this material is very much discouraged. Among the many streets of St. Petersburg, lanes and alleys are unknown, as, while the finest streets have a breadth of 120 ft., the narrowest are 42 ft. broad. The Nevski Prospekt is the most splendid street in St. Petersburg; and for architectural grandeur, as well as for natural beauty, for proportions, and for variety, is considered the finest street in Europe. It is 130 ft. broad, and about 4 m. long, is planted on both sides with trees, contains a large number of the most beautiful palaces, of highly ornamented churches, and splendid warehouses, and increases in breadth and magnificence as it advances from the admiralty. The houses are built of brick faced with stucco, are three and four stories high, and are in many cases furnished with ornamental porches, colonnades, gilded balconies, and parapets, that gird the flat roofs. About ten of the other streets of the city are distinguished for their grandeur, though none of them equals the Nevski Prospekt. There are many squares in the city, and of these the Admiralty square is one of the most famous. It contains one mass of buildings, presenting to the Neva a fine facade, nearly half a mile in length, while its sides are 650 ft. long. In the Palace square, adjoining the admiralty, stands Alexander's column, an immense monolith, erected in 1834. It consists of a shaft of red granite, standing on a pedestal of the same material, and supporting a capital, above which rises the figure of an angel and a cross. The length of the shaft is 80 ft., and that of the whole column 150 feet. Peter's Square contains the noble and well-known equestrian statue of Peter the Great, 18 ft. high, and erected 1768–82. The Field of Mars, large enough to allow of 40,000 men being put through military evolutions, contains the bronze statue of Suwaroff, and a monument to Catharine II.—*Bridges.*—Of the 150 bridges that unite the islands, cross the canals, and span the Neva, the Annitchkoff bridge, leading across the Fontanka canal, consists of five arches, is 110 ft. long, and is decorated with four spirited groups, in bronze, of wild horses and their tamers, by a native artist. The Nikolayevski bridge, a magnificent structure in granite, and the only permanent bridge save one that crosses the Neva—the others being temporary bridges supported on boats, and removed every autumn and spring—was completed in 1850. It crosses the Neva from the English quay on the s. bank of the Vassili Ostrov shore, is 943 ft. long, and consists of seven elegant arches, supported upon ponderous piers of granite. At the northern end of the bridge there is a draw-bridge which affords a passage to ships. No part of St Petersburg affords a foundation solid enough to support weighty structures. The foundation for the Nikolayevski bridge was not obtained until three sets of piles had been driven into the oozy bed of the river, the one on the top of the other, and so close that all the timbers touched each other all the way across.—*Palaces, etc.*—St Petersburg might be called a city of palaces, from the number of edifices of that description which it contains. The Winter palace, destroyed by fire in 1837, but soon after rebuilt, is certainly the largest, and, in one sense, probably the most magnificent palace in the world. The residence of the Grand Duke Michael is one of the handsomest, if not the handsomest, palace of the city. The front has a series of Corinthian columns, the central twelve of which form a portico. The entrance hall is 80 ft. square, and the decorations are magnificent and in good taste. It has numerous ample halls, decorated in the most artistic manner, and containing collections, furniture, and articles of *vertu* of immense value. The Hermitage, situated on the Neva like the Winter palace, is connected with that structure by several galleries. Its gallery of paintings, while not very extensive, is remarkably rich in its specimens of Dutch and German artists of the 17th and 18th centuries, notably Van Dyke, Rubens, Rembrandt, and Teniers. The library of this palace contains the collections of Diderot, Voltaire, etc. The Annitchkoff palace is the residence of the cesarewitch. The imperial library is one of the first in Europe. The gilded tower of the admiralty buildings, which is said to be visible from Cronstadt, and forms a most conspicuous landmark, is 230 ft.

high. The old and new arsenals are surrounded by cannon taken from the Turks and Persians. A triumphal arch, known as the Moscow gate, was erected in 1838 in memory of Russian victories over various countries. The arch is supported on 12 columns, each 68 ft. high and 17 ft. in diameter. The castle in which Peter the Great lived is preserved as a memorial.—*Churches.*—Within the citadel stands the church of St. Peter and St. Paul, finished in 1727. It is surmounted with a slender tower crowned by a gilded spire, the whole being 302 ft. high. The cathedral of St. Izak, though destitute of architectural beauty, is remarkable for its rude magnificence, and as one of the most considerable buildings of modern times; is 364 ft. long, 315 ft. broad, and 336 ft. high. It is surmounted by a great gilded dome, and by four smaller domes. The domes are made of bronze, and the value of the plate-gold by which they are overlaid is stated at \$250,000. Each of its four sides is adorned with a peristyle of 12 or 16 red granite monolith pillars from Finland. A magnificent memorial church has been erected on the site of the assassination of Alexander II.

Academies, Scientific Institutions, etc.—The academy of sciences, with a library of 300,000 books and MSS., was founded by Peter the Great in 1725. In the institute of technology, founded in 1828, 200 pupils are taught silk-spinning, the manufacture of cloth, silk and woolen stuffs, wood-carving, and engraving on copper. The university, founded in 1829, was attended by 3,057 students, and had between 80 and 100 professors in 1896. The new national museum of antiquities, painting, and sculpture, completed in 1851, is a noble structure, built entirely of marble and metal. There are numerous benevolent institutions, a number of splendid theatres, and an Italian opera, a magnificent structure.

Manufactures and Commerce.—About 3,000 ships annually leave the port. The exports have an annual value of over \$45,000,000; the imports of about the same amount. Of the manufacturing cities of Russia, St. Petersburg is one of the most important. The principal manufactures are textiles, paper, sugar, leather, tobacco, copper and iron goods, machinery, and clothing. The annual output is estimated at \$72,000,000.

St. Petersburg is little more than a century and a half old, and yet it takes rank among the first capitals in the world. It was founded by Peter the Great, May 27, 1703. After a long struggle against the severe climate, insalubrious from the exhalations of wide extended marshes, and from the arctic rigor which even yet can cover the Neva with ice a yard and a half thick, at length the town was founded and declared the capital in 1712. Under the successors of Peter, the improvement, embellishment, and extension of the city were carried on. Catharine II. constructed the great canals which, while they afford means of ready communication, serve also to drain the marshlands, to render the atmosphere more healthy, and to mitigate the rigors of winter. The city suffered great damage and the loss of several hundred lives in 1824 from an inundation of the Neva; and every April, when the ice breaks up, the lower regions of the city are threatened with a similar disaster. At St. Petersburg all the ministers from foreign courts are bound to reside.

SAINT PETER'S CHURCH, at Rome, is the largest cathedral in Christendom. It stands on the site of a much older basilica, founded by Constantine, A.D. 306, over the reputed grave of St. Peter, and near the spot where he is said to have suffered martyrdom. This basilica was of great size and magnificence; but had fallen into decay, when pope Nicholas V., in 1450, resolved to erect a new cathedral, worthy of the dignity and importance of the Roman pontificate, then in the zenith of its power. A design was accordingly prepared by Rossellini on a very grand scale, and the tribune was begun, when the pope died. The new building remained neglected for about half a century, when Julius II. resolved to carry out the building, and employed Bramanté, then celebrated as an architect, to make a new design. This design still exists. The foundation stone was laid in 1506; and the works carried on with great activity till the death of the pope in 1513. Bramanté, who died the following year, was succeeded by Baldussare Peruzzi. Almost every architect who was employed during the long course of time required for the erection of this great edifice, proposed a new design. That of San Gallo, who succeeded Peruzzi, is one of the best, and is still preserved. It was not till his death in 1546, when the superintendence devolved on Michael Angelo, then 72 years of age, that much progress was made. He designed the dome; and had the satisfaction, before his death in his 90th year (1564), of seeing the most arduous part of the task completed; and he left such complete models of the remainder that it was carried out exactly in conformity with his design by his successors, Vignola and Giacomo della Porta, and successfully terminated by the latter in 1590 in the pontificate of Sixtus V. The design of Michael Angelo was in the form of a Greek cross, but the building was actually completed as originally designed by Bramanté as a Latin cross, under Paul V., by the architect Carlo Maderno. The portico and façade were also by him. He is much blamed for altering Michael Angelo's plan, because the result is that the projecting nave prevents the dome (the *great* part of the work) from being well seen. The façade is considered paltry, and too much cut up into small pieces. It is observable that this entrance façade is at the *east* end of the church, not the west, as it would certainly have been n. of the Alps. But in Italy the principle of orientation was little regarded.

Maderno's nave was finished in 1612, and the façade in 1614, and the church dedicated by Urban VIII. in 1626. In the front of the portico is a magnificent atrium in the

form of a piazza, inclosed on two sides by grand semicircular colonnades. This was erected under Alexander VII., by the architect Bernini.

The façade of the cathedral is 368 ft. long and 145 ft. high. As already mentioned, the design is not generally approved, but some allowance must be made for the necessities of the case. The balconies in the front were required, as the pope, at Easter, always bestows his blessing on the people from them. Five open arches lead into a magnificent vestibule, 439 ft. long, 47 ft. wide, and 65 ft. high, and adorned with statues and mosaics. Here is preserved a celebrated mosaic of St. Peter walking on the sea, called the *Navicella*, designed by Giotto in 1298, and preserved from the old basilica. The central bronze doors are also relics saved from the old church. On entering the interior of the cathedral, its enormous size does not produce the impression its grandeur of proportions should do on the spectator. This arises from the details being all of an excessive size. The pilasters of the nave, the niches, statues, moldings, etc., are all such as they might have been in a much smaller church, magnified. There is nothing to mark the scale, and give expression to the magnitude of the building. The figures supporting the holy water fountain, for example, appear to be those of cherubs of a natural size, but when more closely approached, turn out to be 6 ft. in height, and the figures in the niches are on a still more colossal scale. The cathedral is 613 ft. long, and 450 ft. across the transepts. The arch of the nave is 90 ft. wide, and 152 ft. high. The diameter of the dome is 195½ feet. From the pavement to the base of the lantern is 405 ft., and to the top of the cross 434½ ft. The dome is thus 50 ft. wider, and 64 ft. higher than that of St. Paul's (q. v.) in London.

The walls of the interior are adorned with plates of the richest marbles, and copies of the most celebrated paintings executed in mosaic. The arch piers have two stories of niches with statues of saints, but these, unfortunately, are in a debased style of art. The pavement is all in marbles of different colors, arranged in beautiful patterns designed by Giacomo della Porta. The dome is, however, the finest part of the cathedral; it is supported on four great arches. Immediately under the dome stands the high altar over the grave of St. Peter. It is surrounded by a magnificent baldacchino or canopy, in bronze, which was designed by Bernini in 1633, and executed with bronze stripped from the pantheon by pope Urban VIII. Beneath the high altar is the shrine, in which 112 lamps burn day and night. The building is adorned with many remarkable monuments and statues, some of them by Michael Angelo, Canova, and Thorwaldsen. The most of the monuments are erected in memory of the popes, but there is one to the exiled Stuarts, "James III., Charles III., and Henry IX., kings of England," their remains being buried in the vaults beneath. The "grotte Vaticane," or crypt, has been most carefully and religiously preserved during all the changes and works of the cathedral; so much so, that the ancient pavement remains undisturbed.

As a work of architectural art, St. Peter's is the greatest opportunity which has occurred in modern times; but, notwithstanding the great names of the men who were engaged upon the work, it is universally admitted to be a grand and lamentable failure.

SAINT PETER'S COLLEGE, Cambridge, commonly called Peter-house, was founded before any other college now existing in England—viz., in 1257, by Hugh de Balsham, bishop of Ely, and was endowed by him in 1282, with a maintenance for a master and 14 fellows. In addition to the 14 original foundation-fellows, there are two bye-fellows on different foundations, and 23 scholars. The master is elected by the society.

SAINT PETER'S LE PORT, or commonly *St. Peter's*, the chief town of Guernsey, one of the channel islands. See GUERNSEY.

SAINT PIERRE, the chief t., though not the seat of government, of the island of Martinique (q. v.), belonging to France, stands at the head of a bay, 16 m. n.w. of the capital, Fort-la-France (formerly Fort Royal). It is the largest town in the Antilles, with a pop. '89, of 29,210, and is the chief entrepôt of those islands.

SAINT PIERRE, a t. of the island of Bourbon (q. v.), or Réunion, on the s.w. coast. Pop. '89, 24,270.

SAINT PIERRE, CHARLES IRÉNÉE CASTEL, Abbé de, 1658-1743, b. France; entered the priesthood. He was appointed chaplain to the bishop of Orleans in 1702; and soon afterwards received the abbey of Tiron. He accompanied cardinal Polignac to the congress of Utrecht in 1712, and the next year appeared the first part of his *Projet de Paix perpétuelle*. He was expelled from the academy on account of his *Discours sur la Polysynodic*, 1718, which favored a constitutional government, and attacked Louis XIV. He continued to advocate his views in the so-called *club de l'entresol*, which was closed by Fleury in 1731.

SAINT PIERRE, JACQUES HENRI BERNARDIN DE. See PIERRE.

SAINT PIERRE AND MIQUELON, a French colony s. of Newfoundland, opposite the gulf of St. Lawrence, consisting of the islands of Great and Little Miquelon and St. Pierre; about 10 sq. m.; pop. '89, 5,355. The chief occupation is fishing. Capital, St. Pierre.

SAINT-PIERRE-LES-CALAIS, a t. of France, in the department of Pas-de-Calais. It was formerly regarded as the south-eastern suburb of Calais, to which it nearly adjoins,

but was united to Calais 1885. It is famous for its manufactures of tulle (q.v.). Other branches of industry are also actively prosecuted, as the manufactures of leather and beet-root sugar. See CALAIS.

SAINT PÖLTEN is a fortified t. of lower Austria, 35 m. w. of Vienna. It is the seat of a cathedral, and has manufactures of cotton, paper, glass, and stoneware goods. Pop. 8000.

SAINT QUENTIN, a thriving manufacturing city in the n. of France, department of Aisne, is situated on the Somme, about 25 m. n.w. of Laon. Its population has more than doubled in 25 years, and in 1896 was 48,868. St. Quentin has a celebrated church—"one of the finest, boldest, and purest Gothic buildings in this part of Belgic Gaul." St. Quentin is the center of a manufacture of linen, muslin, lace, and gauze. There are also sugar refineries. The *canal of St. Quentin*, connecting the basin of the Somme with that of the Scheldt, was finished by Napoleon in 1810. It is carried through the intervening hills by tunnels. At St. Quentin a battle was fought, ^{July 29,} ~~Aug. 10,~~ 1557, between the Spaniards, assisted by a body of English troops, and the French, in which the latter were defeated.

SAINT REGIS, a twin village in n. New York and s. Canada, province of Quebec, on the s. bank of the river St. Lawrence; pop. abt. 1500. It is inhabited by the St. Regis family of the Iroquois tribe of Indians, by whom it was settled in 1760. They speak the Mohawk language, and are generally of the Roman Catholic faith. They are divided, like the town, into British and American; the former numbering 800, and the latter 683, the allegiance due either government being transmitted through the female line. The reservation in Canada is rather larger than that on this side the line, which is 14,000 acres. The national boundary passing through it places it partly in Franklin co., N. Y., and partly in Huntingdon co., Quebec. It is connected with Cornwall on the opposite bank by a ferry. The Indians are engaged principally in the manufacture of lacrosse sticks and baskets.

SAINTS, a name applied in the New Testament to the members of the Christian community generally, but restricted by ecclesiastical usage from very early times to those who, whether under the old or under the new dispensation, have been specially remarkable for their personal virtues and their eminent services to the cause of religion. Of the old dispensation, the "patriarchs and prophets" are commonly designated as saints. But the word is used much more of the Christian church. In the ages of persecution the quality which most of all challenged the admiration and reverence of the faithful was naturally courage and constancy in the profession and the defense of the Christian faith; and thus the earliest of those whom the church reverences for sanctity of life, are also, for the most part, revered as champions of the faith. In general, however, the saints are distributed into several classes, chiefly in relation to the special services which the church has appropriated to their honor. Thus we find enumerated: 1. Apostles and evangelists; 2. Martyrs; 3. Confessors, a name applied primitively to those who had exhibited great constancy in professing the faith, although without the final crown of martyrdom, but in later times understood of all who, without being martyrs, were eminent for sanctity of life; 4. Doctors, or men eminent for sacred learning; 5. Virgins; 6. Matrons and widows distinguished for holiness of life. Anciently the character and appellation of saint were bestowed upon individuals, as it were, by acclamation, and by the common voice of the members of the particular Christian community to which the individual belonged, or to which his merits were most familiar. The earliest examples, as may be seen in the letter of the church of Smyrna on the martyrdom of Polycarp, of such judgments as to individuals were in the case of martyrs. Altars were erected at their tombs, and the people assembled for worship on the anniversary of their martyrdom. Even then, however, the letters of St. Cyprian (Epp. 37 and 39) show that caution was observed by the bishops to guard against the recognition of undeserving individuals. The honors of the martyrs, even before the age of persecution had passed, were extended to confessors of the faith, and eventually to all who were eminent for holiness of life, and especially to those who obtained the reputation of performing miracles. The names of those who were so honored were placed in the register (or diptych) of each church. It was not, however, till a comparatively late period that a regular form of procedure was established in the Roman church for the purpose of testing the claim of individuals to the authentic reputation of sanctity. From the 4th c. downward, examples of reference to Rome—as, for instance, in the Acts of Virgilius, bishop of Trent—are cited by Catholic writers. But the first recorded example of a solemn and public decree is in the case of Udalric or Ulric, bishop of Augsburg, to whom the honors of sanctity were adjudged by pope John XVI. (see Hardouin, Council. VI. P. I., p. 727) in the end of the 10th c. (993). Since that time the procedure of the church of Rome as to the public recognition of the saints has been matured and methodized. It consists of two stages, that are called respectively "beatification" and "canonization." The former is but a preliminary process, and consists in a declaration by the pope that the "beatified" person is entitled, by reason of his (or her) eminent virtues, attested by miracles, to be regarded as a saint, and as such honored and invoked. This authorization, however, is not in beatification extended to the entire church, but is always limited to a particular church, or province, or religious order; and

the nature of the honors permitted to be paid to the beatified person is strictly defined either by the terms of the decree, or by local usage, if such have already existed. But although the effect of a decree of beatification is less comprehensive than that of the subsequent and final declaration in canonization, the preparatory inquiry is in all substantial particulars the same. The details of both are explained at great length and with curious minuteness by the learned pope Benedict XIV. (Lambruschini) in a special work on the subject, which has the further interest of containing, as an appendix, the minutes of the entire proceedings in the canonization which took place during his own official connection with that department. The inquiry in both procedures is conducted by the congregation of cardinals, called the congregation of rites, and consists first in an examination of the writings (if there be any) of the individual, then of the holiness of his life and conversation, and finally of the miracles alleged to have been performed by him in life, or obtained through his relics, and intercession after death. Two such miracles at least must be established by what is considered satisfactory evidence. Upon all these points sworn depositions are required, and all are subjected to a most rigorous scrutiny, in which the office of impugnator is discharged by an advocate called *promotor fidei*, and popularly nicknamed the devil's advocate, his duty being to raise every possible difficulty in the way of the acceptance of the evidence of sanctity. This inquiry is generally a very protracted one; and after it has been completed, and its results recorded in writing, the acts are submitted to the cardinals, who meet three times in private congregations, and finally, if all appears satisfactorily established, in a public congregation, by which the decision is made known to the pope. Should the decision be approved by the pope the solemnization is proceeded with. The solemnity takes place in the Vatican church. The cardinal prefect of the congregation of rites hands the pope's brief to the cardinal, arch-priest of the Vatican, by whom it is read; the *Te Deum* is intoned; the image of the beatified individual is uncovered to receive the veneration of the assembly; high mass, with the collect, in his honor, is sung; and in the afternoon the pope goes solemnly to the church to pay reverence to the image. The procedure, in case of a martyr, is somewhat different. In both, however, the process is but preliminary to the solemn canonization. The effect of the latter comprises: 1. A declaration that the canonized person is to be recognized as a saint throughout the entire church; 2. That he is to be invoked in the public prayers; 3. That churches and altars may be erected in his honor; 4. That he may be invoked in the mass and public service; 5. That a festival may be celebrated in honor of him; 6. That his image may be set up in public; and lastly, that his relics may be preserved and publicly honored. The solemnity of canonization, which is preceded by a new inquiry similar to that of the beatification, and a new judgment of the congregation of rites confirmed by the pope, is one of the most gorgeous in the entire ceremonial of the Roman church. It takes place in the Vatican church (St. Peter's), and is generally attended by a large assembly of bishops from various parts of the church. In many respects it resembles that of the beatification, but its distinctive characteristic is the solemn publication, by order of the pope in person, after the hymn of invocation of the Holy Ghost has been sung, of the decree of canonization. This is followed by mass, also celebrated by the pope in person, and sometimes by a homily of the pope in honor of the newly canonized. Roman Catholics hold that in such decrees the judgment of their church is infallible; and to deny that any particular canonized individual is really a saint is held to involve, if not actual heresy, at least a grievous act of contumacy against the faith of the church. On the doctrine of saint worship, see INVOCATION OF SAINTS; and on that regarding the honor paid to relics of saints and martyrs, see RELICS.

SAINT-SAËNS, CHARLES CAMILLE, a French composer and pianist, born at Paris, Oct. 9, 1835. When seven years of age he began to study the piano, and five years later entered the conservatoire where he was the pupil of Halévy, Reber, Benoit, and Gounod. His first symphony was composed when he was 16 years old. In 1853 he became organist of St. Méry, and from 1858-77 was organist at the Madeleine. He is best known for his instrumental works, which include the symphonic poems, *Phaëton*, *Le Rouet d'Omphale*, *Danse Macabre*, *La Jeunesse d'Hercule*, etc., masses and chamber music, the operas *Le Timbre d'Argent* (1877), *Etienne Marcel* (1879), *Henri VIII* (1883), *Ascanio* (1890), *Phryne* (1893). He is a commander of the Legion of Honor. He has published *Matérialisme et Musique* (1882), *Harmonie et Mélodie* (1885), etc.

SAINTSBURY, GEORGE, born 1845; an English literary historian and critic. From 1876 to 1895 he was a journalist in London, when he was made professor of English at the university of Edinburgh. Among his writings are a *Life of Dryden* (1881), *A Primer of French Literature* (1880), and an excellent *Short History of French Literature*, and *Essays on French Novelists* (1891); and *Corrected Impressions* (1895), and *A History of Nineteenth Century Literature* (1896). He contributed largely to the *Encyclopedia Britannica*, and has edited several volumes of selections from French authors.

SAINTS' DAYS, days set apart in honor of particular saints and martyrs. The practice dates from the times of persecution, when the people were wont to assemble at the tombs of martyrs on the anniversary of the martyrdom. In the multiplication of such celebrations, a record of the days fixed for each saint or martyr became necessary. This was called *calendarium*. The days so appointed were celebrated with more or less solemnity, according to the dignity of the saint, or the degree of devotion with which he

was regarded. In some cases the saint's day was kept as a holiday of obligation, in which no servile work was permitted to be done. Other days are of various minor degrees of solemnity, and are called double (greater or lesser), semi-double, and simple, from the peculiar form of the office set apart for each. In particular countries, provinces, dioceses, or parishes, the day of the patron saint is specially celebrated; and in all churches the festival of the saint to whom the church is dedicated.

SAINT SIMON, LOUIS DE ROUVROI, Duc de, whose family claimed to be descended from Charlemagne, was born in Jan., 1675. After receiving a careful education under the superintendence of his mother, he entered the army in 1692, but considering his promotion not equal to his deserts, he resigned his commission in 1702, and devoted the remainder of his life to a sort of court statesmanship. Saint Simon's position was as singular and as anomalous as his character. Profoundly ambitious, his pride was yet greater than his ambition. His ideas of aristocratic rights and privileges were perhaps more outrageously fanatical than any ever entertained in modern ages; and the whole aim of his life was to nullify the influence of the parliament, and to place the government of France in the hands of the *grands seigneurs*—the great territorial lords. The middle class he abhorred; and the rise to distinction of any one belonging to that order—any *novus homo*, tortured his patrician soul almost beyond endurance. We have not space (nor would it be worth our while, if we had) to recount his career of haughty and insolent conspiracy against the political rights of commoners, which marks him out as the most thoroughgoing oligarch in principle of whom we have any record. During the latter part of Louis XIV.'s reign, and the regency of the duke of Orleans, he enjoyed much consideration, and his aristocratic policy more than once enjoyed a temporary triumph; but with the accession to the regency of the duke of Bourbon he fell into disgrace, and withdrew from public life. He died at Paris, Mar. 2, 1755. Saint Simon's last years were occupied chiefly in the composition of his famous *Mémoires*, a work of incalculable historical value. Though the style is far from faultless, it so admirably expresses the meaning of the author, that one would not wish it other than it is. The *Œuvres Complètes de Louis de Saint Simon* appeared at Strasburg in 1791, in 13 vols., an edition by Cheruel and Regnier (20 vols.) in 1856; revised, 1873-77. See Baschet's monograph, 1874. Boislisle's issue of the *Mémoires*, 1880; and Faugère's *Œuvres inédites de S. S.*

SAINT SIMON and SAINT SIMONIANISM. **CLAUDE HENRI, Comte de SAINT SIMON**, a French social philosopher, founder of the sect named after him, *Saint Simonians*, belonged to a different branch of the same family as the preceding, and was born at Paris, Oct. 17, 1760. Although destined to become the propagator of the most revolutionary and democratic ideas of modern times, he was reared in a perfect hot-bed of aristocratic prejudice. Nevertheless, from his earliest years, Saint Simon exhibited a decided hostility to the established system of things, mainly, however, it would seem (according to the anecdotes in vogue) from a certain puerile vehemence and obstinacy of nature. He was cursed, moreover, with a precocious vanity. What are we to think of a lad scarcely 16 giving his servant orders to rouse him every morning with such a flattering summons as *Levez-vous, Monsieur le Comte, vous avez de grandes choses à faire*, especially when, in point of fact, he had *nothing* to do? Saint Simon was pretty well educated in philosophy, like most of the young nobles of his time, and had D'Alembert among others for his tutor. At 18 he entered the army, served in America, and distinguished himself on the day when Lord Cornwallis surrendered at Yorktown (Sept. 17, 1781), with all his forces. Captured by the British on his return home, he was taken to Jamaica, where he remained till the peace in 1783 restored him to liberty and France. But the monotony of garrison life did not suit his restless and impatient spirit, and in 1785 he quitted the service, and traveled in Holland and Spain, busying himself with various industrial schemes, such as connecting Madrid with the sea by means of a canal, and introducing *diligences* into Andalusia—the latter of which proved successful. The great revolution found in him—noble though he was—an enthusiastic disciple, and he voted in his patrimonial canton for the abolition of titles of nobility, but did not take any part in the political events that followed. His energies were devoted to matters more profitable than patriotic—viz., the purchase of confiscated property—and it is unhappily not at all doubtful that when France was laboring in the agony of a mighty struggle after new life, Saint Simon was consumed by an ignoble passion for enriching himself. But then, as his disciples have naïvely observed, it was necessary that he should acquire a fortune in order that he might be able to devote himself satisfactorily to ideas. It was during the revolution, and while suffering a temporary imprisonment in the Luxembourg, that visions of a new social system, based on scientific principles, and not on political conventionalities, first unfolded themselves before his ardent imagination. His ancestor Charlemagne appeared to him one night in a dream, and said: *Depuis que le monde existe aucune famille n'a joui de l'honneur de produire un héros et un philosophe de première ligne. Cet honneur était réservé à ma maison. Mon fils, tes succès comme philosophe égaleront ceux qu'j'ai obtenu comme militaire et comme politique.* Saint Simon, though now 38 years of age, commenced to study "science," of which he was as yet quite ignorant. The plan he adopted was pleasant and ingenious. He took a house opposite the École Polytechnique, and invited to his table the professors of mathematics, of physics, and of astronomy, from whose lips—in the intervals of their feeding—he acquired the necessary information. Then he changed his lodgings, and fixed himself near the École de Médecine, where, pur-

suings the same method with the physiologists, he learned from them something of the structure of organized bodies. In 1801 he married, and threw open his *salons* to all the savants and artists of Paris; but his lavish hospitalities—prodigalities, perhaps, they ought rather to be called—soon dissipated the fortune he had amassed during the revolution. Meanwhile a notable social idea seized him. Hearing that the husband of Madame de Stael had just died, he resolved to marry the widow, whom he considered to be the only woman fit to associate with him in his great project for the regeneration of society. To be sure there was a little impediment in the way—viz., his being already married; but in France there is never any difficulty in getting a divorce; and Saint Simon was soon as good as a bachelor again. Betaking himself to Coppet, he unfolded his plan to the lady, and begged her concurrence, urging his suit (it is said) by the most impressive considerations; *Madame, vous êtes la femme la plus extraordinaire du monde; comme j'en suis l'homme le plus extraordinaire; à nous deux nous aurions, sans doute, un enfant plus extraordinaire encore.* Madame de Stael, however, declined to further the philanthropic projects of Saint Simon in the way he wanted, and the reformer—now beginning to be in straits—published at Geneva a *Lettre d'un Habitant de Genève à ses Contemporains* (1803), in which he proposes (among other things) that there should be an annual subscription for the benefit of men of genius—mathematicians, physicians, chemists, physiologists, litterateurs, painters, and musicians—that spiritual power should be in the hands, not of the clergy, but of savants, and temporal power in the hands of the landed proprietors, while the privilege of choosing “chiefs of humanity” should belong to everybody; finally, he asserts that religion is only a human invention. Saint Simon’s proposal (so obstinately prejudiced are men against what is right) was not adopted—was not even noticed, either by “men of genius” or others, and in the course of a few months he was glad to accept the office of copyist at the Mont-de-Piété. Even this humble means of making a livelihood he had to resign from ill health, and he would probably have died of starvation had he not fallen in by chance with an old revolutionary friend called Diard, who took him into his house and furnished him with means to publish one of his most important works, the *Introduction aux Travaux Scientifiques du Dix-neuvième Siècle* (Par. 1807). The death of Diard, in 1810, once more plunged Saint Simon into misery. Soon after, we find him writing to Lacépède, Cuvier, Dégérando, Cambacères, etc., in this style: “*Monsieur, soyez mon Sauveur, je meurs de faim . . . Depuis quinze jours, je mange du pain et je bois de l'eau; je travaille sans feu et j'ai vendu jusqu'à mes habits pour fournir aux frais des copies de mon travail.*” There is nothing ludicrous here—it is the plain unaffected agony of utter want. In 1812 his wretchedness came to a crisis; he left Paris, betook himself to Peronne, where he fell dangerously ill, but recovered through the attentions of his family, who now settled a small pension on him; he then returned to Paris. After the restoration, he began—in spite of his extravagant vanity—to reap the never-failing reward of enthusiasm and perseverance—a crop of disciples. Of these the most distinguished was Augustin Thierry, who assisted him in the redaction of his *Réorganisation de la Société Européenne*—a work intended to demonstrate the inutility of the congress of Vienna, and the incapacity of all mere political congresses to establish a durable peace. He proposes the institution of a European parliament, having the right to arbitrate in cases of difference among the various nations, and adds that the first step toward the reorganization of Europe is the union of France and England. In 1817–18, he published *L'Industrie, ou Discussions Politiques, Morales, et Philosophiques*, partly written by himself and partly by his disciples. The third volume is the work of the celebrated Auguste Comte (q.v.). By this and other literary enterprises Saint Simon had exhausted all his funds, and as he saw no prospect of getting any more, he resolved to commit suicide, and actually discharged a loaded pistol at his own head (Mar. 9, 1823), which, however, only deprived him of an eye, and not of life. The last, and by far the most remarkable work of Saint Simon, is his *Nouveau Christianisme* (Par. 1825), which contains his final and matured convictions. According to him, Christianity has been diverted from its original design. Progressive by nature, and meant to be modified by the changing circumstances of times and countries, it has been stiffened into unalterable dogmas by ecclesiastical conclaves. The clergy, whose mission is to instruct, are ignorant of the thoughts and manners of modern times, and have exhibited a complete and deplorable incapacity. Protestantism is no wiser than Catholicism. It has set its face against the fine arts, and has shown a cruel and fatal indifference to the physical amelioration of the poor. But genuine Christianity embraces in its consideration all the needs of humanity. From its grand principle, “love one another,” it derives the proposition, that “religion ought to direct all the social forces toward the moral and physical amelioration of the class which is at once the most numerous and the most poor.” From this premise is deduced the idea of a social hierarchy based on capacity and labor—the new spiritual church comprising all functions and professions, sanctifying science and industry, regulating vocations, fixing salaries, dividing heritages, and taking the best measures to make the labors of each conduce to the good of all. Saint Simon did not live to carry out his principles in detail as far as they would have logically carried him, dying on May 19, 1825; but in the writings of Comte we find the legitimate terminus and result of his sweeping speculations. Much in the character and system of Saint Simon is unquestionably false, exaggerated, and even laughable; but the man who reckoned among his disciples names like MM. Augustin Thierry, Auguste Comte, Olinde Rod-

rigues, Bailly (de Blois), Léon Halévy, Duvergier, Bazard, Enfantin, Cerclet, Buchet, Carnot, Michel Chevalier, Henri Fournel, Dugied, Barrault, Charles Duveyrier, Talabot, Pierre Leroux, Jean Reynaud, Emile Péreire, Félicien David, Saint Cheron, Guérout, Charton, Cazeaux, Dubochet, and Stéphane Mouy—one whom posterity will not willingly forget.

SAINT SOPHIA, CHURCH AND MOSQUE OF, a celebrated structure at Constantinople, long an object of great interest to all visitors of that city. It was originally built by the emperor Constantine in 325–326, on occasion of the translation of the seat of empire to Byzantium; and is so called as being dedicated, not, as commonly supposed, to a saint of that name, but to the *Hagia Sophia* (holy wisdom), that is to the eternal wisdom of God or the Logos, the second person of the Trinity. The building of Constantine was subsequently rebuilt and enlarged by his son Constantius; and this second church of Constantius having been destroyed in 404, was rebuilt by Theodosius the younger in 415; and it lasted unaltered till the celebrated Nika sedition, or battle of the factions of the circus, under Justinian, in 532, in which it was totally destroyed. The present building is substantially that which was erected by Justinian in expiation of this sacrilege. It occupied less than seven years in its erection, and the history of the work and of the details of its material and its construction are full of marvels. Ten thousand workmen are said to have been employed upon it. The materials were supplied from every part of the empire, and comprised remains of almost every celebrated temple of the ancient paganism. The sedilia of the priests and those of the patriarch were of silver gilt. The dome of the tabernacle was of pure gold, and was surmounted by a gold cross weighing 75 lbs., and incrusting with precious stones. All the sacred vessels and other apparatus were of gold. The altar-cloths were embroidered with gold and pearls; and the altar itself was composed of a mass of molten gold, into which were thrown pearls, sapphires, diamonds, onyxes, and every other object which could raise its costliness to the highest imaginable degree. The total cost of the structure is stated by the ancient authorities at 320,000 pounds. Some regard this as pounds-weight of silver, others as of gold. One of the latest writers on the subject, Mr. Neale (*Eastern Church*, vol. i. p. 237), adopts the latter estimate, and thus computes the cost at the enormous sum of \$65,000,000.

The building may be described as a square of 241 ft., forming interiorly a Greek cross, and surrounded in the interior by a woman's choir or gallery, supported by magnificent pillars, for the most part borrowed from ancient buildings. In the center rises a dome, which is supported by two great semi-domes, which in their turn rest upon smaller semi-domes, the whole presenting a series of unexampled beauty. The height of the dome is 175 feet. The building is approached by a double porch, which is about 100 ft. in depth. The whole of the interior was richly decorated with sculptured marble and mosaics. Even in the reign of Justinian, a further reconstruction of the building became necessary, the dome having fallen in, on an earthquake; but this may be said to have been the last important change in the structure within the Christian period of Constantinople.

On the occupation of that city by the Turks in 1453, St. Sophia was appropriated as a mosque. All its purely Christian fittings and internal structures were swept away. The Christian emblems were either mutilated or covered up from view by a coating of plaster. The latter course was adopted throughout the building in the case of mosaic pictures containing representations of the human figure, which the Koran proscribes as unlawful, and thus the original mosaics of the Justinian era have in great part escaped destruction. Some years since, the late sultan, Abdul Medjid, having ordered a complete restoration of the building, these mosaics were accidentally brought to light, and, with the consent of the sultan, artists were sent out from Berlin, who, with the assistance of the architect employed by the Turkish government, made accurate copies of all these interesting relics of antiquity, which have been published at the expense of the Prussian government by M. Salzenberg, the artist thus employed by the king. The interior of the building at present is very judiciously restored for Mohammedan worship, the Christian decorations being again carefully covered up, coated with plaster in imitation mosaic-work. Like all mosques, St. Sophia is closed against Christian visitors except upon special firman, which, however, is easily obtained, and the privilege may be had at small expense by the traveler through the interposition of the masters of the principal hotels.—See Von Hammer's *Constantinopolis und der Bosphorus* (2 vols. 8vo, Pesth, 1822); Salzenberg's *Alt-Christliche Baudenkmäler Constantinopels* (Berlin, 1854); Haghes, *Aya Sofia Constantinople* (London, 1854); *Edinb. Review*, April 1865, p. 456, and foll.; and *Constantinople*, by W. Besant, 1879.

SAINT STEPHEN, a seaport town in Charlotte co., New Brunswick, Canada; on the St. Croix river at the head of navigation, and on the New Brunswick Central and the Grand Southern railroads; opposite Calais, Me. It has regular steamboat communication with Eastport, Me., and other points all the year; has important manufactories, aided by unsurpassed water power; is lighted by gas; and has large lumbering interests. In many respects its business interests are identical with, or closely connected with, those of Calais, with which it is joined by a toll-bridge. Pop. '91, 2,680.

SAINT TAMMANY, a parish in s.e. Louisiana, bounded on the e. by the Pearl river, on the s.w. by lake Pontchartrain, watered by the Chefonte and Bogue Chitto rivers; on the East Louisiana railroad; about 915 sq.m.; pop. '90, 10,160, includ. colored. The surface is level and heavily timbered. The soil is poor. The principal productions are rice, corn, wool, and molasses. Much lumber is exported. Parish seat, Covington.

SAINT THOMAS, city in Canada, capital of Elgin co., 75 m. s.w. of Hamilton; has various manufactures, the most important of which is car building. Pop. '91, 10,370.

SAINT THOMAS, one of the most westerly of the group of Virgin islands, is situated in lat. 18° 20' n., long. 65° w.; area (according to latest surveys), 32 sq.m.; pop. '90, 12,019. It belongs to Denmark.

The interior of the island is mountainous, and not very fertile. Since the emancipation of slaves in 1847, the cultivation of sugar has been entirely abandoned. Cotton is planted, but only in small quantity. The climate is hot, dry, and unhealthy; yellow fever is endemic, and preys much upon Europeans, the natives being seldom affected by it.

The principal town, Charlotte Amalie, is situated on the side of the mountain, and descends nearly to the margin of the harbor. The houses, which appear from the harbor tier above tier, and have a beautiful and picturesque effect, are built of a bright cream-colored limestone, surrounded with balconies, verandas, and jalousies, fancifully painted, and the roof covered with galvanized iron or shingles (the latter gayly colored when brightened up with the rays of a tropical sun), and presenting at night, when lighted up with lamps, a very striking effect. The town itself is laid out with rather narrow streets, but there are some good stores and hotels in the place. The governor's house, to the e. of the town, is a large and imposing building; and an ancient ruin, "Blue Beard's castle," crowns an elevation. The harbor is land-locked on three sides; the entrance to it, fortified on both sides, is rather narrow. The harbor is spacious, and has deep water, is much occupied with shipping of many nations, and has been much improved since 1864 by dredging.

In Oct., 1867, a fearful hurricane took place. In Jan., 1868, Denmark agreed to a treaty for the sale of St. Thomas and St. John to the United States; but as the United States Congress declined to ratify it, the treaty never took effect.

SAINT THOMAS, an island off the w. coast of Africa in the gulf of Guinea, belonging to Portugal, 260 m. s.w. of Fernando Po. Area about 358 sq. miles. Pop. '78, 18,266. The highest point is Pico de São Thomé (7028 ft.). The heat of the climate is mitigated by the equatorial current, and the island has a heavier rainfall than the mainland. Sugar was formerly grown extensively; coffee and cocoa are now the chief articles of export, but sugar-cane, cacao, and vanilla are cultivated. The Portuguese discovered the island in 1470. In 1876 slavery in St. Thomas was abolished by the Portuguese government. The chief town is St. Thomas or Chaves, on the n.e. coast, and has a small but good port.

SAINT THOMAS. CHRISTIANS OF, a remarkable religious community settled from a very early date on the Malabar coast of the Indian peninsula. They take their name from the apostle St. Thomas, who, according to a very ancient tradition, for which, however, no very positive evidence or satisfactory authority can be alleged, preached in India, and is regarded as the apostle of that country. As early as the 6th c. the well-known voyager, Cosmas Indicopieutes, reports of numerous Christian communities settled in India, under the pastoral care of bishops sent from Persia. To this circumstance it may be attributed that the Indian Christians, like those of what may be called the mother church of the Persian kingdom, lapsed into the Nestorian heresy, which, after the decrees of Ephesus and Chalcedon, having been suppressed by the civil laws of the Roman empire, was driven beyond the limits of Roman authority, and found its most favored seat among the hostile Persians. Once established among the people, these opinions continued to be professed by the Christians who survived in those regions the vicissitudes of the revolutions of which India in mediæval times was the scene. Their seat was almost entirely along the Malabar coast, and extended from the s. cape, Comorin, as far as Calicut; and they are found scattered throughout this length over the whole space from the western declivity of the Ghauts to the sea. From the time of their lapsing into Nestorianism, their bishops were ordained by the Nestorian patriarch of Babylon, and they possessed certain civil rights under the successive dynasties which ruled in the s. of India. On the whole, however, they were much oppressed; and on the arrival of the Portuguese in 1598, the Christians of St. Thomas, although Nestorians, regarded them as their deliverers. Nevertheless, the diversity of creed was at once recognized by the western missionaries, and attempts were made by the successive bodies of missionaries, Franciscans, Dominicans, and finally Jesuits, to reconcile them to the Roman church. A union, more or less real, was effected by a synod held at Diamper in 1599; and one of the Jesuit fathers, padre Roz, was named bishop in 1601. This union, however, was not lasting; they fell away once again from the Roman communion, and the expulsion of the Portuguese from Cochín by the Dutch completed the disruption. A considerable number of them, however, were again united to Rome through the missionaries of the Carmelite order; and toward the close of the 17th

c., the emperor Leopold I. obtained the leave of the Dutch to send a bishop and 12 priests of that order to the Malabar coast. One of the most serious impediments to the influence of those missionaries, as well with the schismatics as with the heathen, was found in the intrigues and jealousies of the Portuguese. In later times, the Christians of St. Thomas, have for the most part been absorbed in the native Christian population. Their tenets were in the main those of the Nestorians of Chaldea and Mesopotamia, about the precise details of which much controversy has prevailed, and many conflicting statements have been made, according to the religious views of the various travelers or missionaries who have reported regarding them. Much of this conflict of testimony arises from a confusion of names rather than of things. See **NESTORIANS**.

SAINT TROND, a city in the province of Limburg, Belgium, in the arrondissement of Hasselt. It is on several railways, contains a number of churches and a fine city hall; manufactures hats, lace, sugar, oil, leather, etc., and in 1890 had a population of 12,895. Until the close of the 18th century it was the seat of a well known Benedictine abbey.

SAINT VINCENT, a British island of the West Indies, belongs to the Windward group, and lies about 28 m. s. of St. Lucia, and 100 m. w. of Barbadoes. Lat. $13^{\circ} 10' \text{ n.}$, long. $61^{\circ} 5' \text{ west}$. It is $15\frac{1}{2}$ m. long, $10\frac{1}{2}$ m. broad, has an area of 132 sq. m., and contained (1893) 42,400 inhabitants, of whom 2800 were white, 554 were colored, and 31,005 black. A chain of mountains traverses the island from n. to s. and throws out lateral branches, between which are ravines, which widen into valleys as they approach the sea-shore. Evidences of volcanic action are everywhere visible on the island—strata are upheaved and disturbed, and huge masses of rock have been displaced. In the interior is a volcanic mountain, 3,705 ft. high, the crater of which is half a mile in diameter. The climate is hot, the temperature ranging from 75° to 87° . The annual rainfall is about 78 inches. No valuable minerals have as yet been discovered. The chief products are sugar, arrowroot, rum, spices, cocoa, and molasses. The value of the exports in 1893 was £144,694, of imports, £93,422. In the same year vessels of 274,132 tons entered and cleared the ports. Religion and morality are at a low ebb—more than half the children are reported as illegitimate. There are above 45 schools. The revenue was in 1893, £27,914; the expenditure, £29,439; and the colonial debt, £16,240. The value of trade is steadily decreasing. The government consists of an administrator and colonial secretary and a legislative council composed of four official and four non-official members. The capital is Kingston (q.v.), and the other one or two small towns or villages are of little note. In 1861 the importation of coolies from India was commenced, 500 of them having been brought to the island in that year. Shocks of earthquake are frequent; hurricanes occur at intervals, and the violent rains occasionally damage the crops and roads.

SAINT VINCENT, CAPE, in Portuguese *Cabo da Sao Vicente*, a promontory forming the south-western corner of Portugal and of Europe, off which several important naval battles have taken place. On June 16, 1693, Admiral Rooke, with 20 English men-of-war, was here attacked by a vastly superior French fleet, and defeated with the loss of 12 men-of-war and 80 merchantmen which were sailing under his convoy; on Jan. 16, 1780, Admiral Rodney here destroyed several Spanish ships; on Feb. 14, 1797, the great battle of cape St. Vincent, between 15 British line-of-battle and 6 frigates, under Admiral Jervis (afterward created earl St. Vincent), and 27 Spanish line-of-battle and 12 frigates, resulted in the total defeat of the latter and capture of 6 of their largest ships (of which, however, 4 only were ultimately secured). The effect of this last victory was to frustrate the formidable Spanish-French scheme of invading England. The fourth naval fight off cape St. Vincent took place between the fleet of queen Maria of Portugal, commanded by sir Charles Napier (q.v.), and that of Dom Miguel, in which a portion of the latter was destroyed, and the rest captured, 5th July, 1833.

SAINT VINCENT, EARL OF. See **JERVIS, JOHN**.

SAINT VI'TUS DANCE. See **CHOREA**.

SAIS, an ancient Egyptian city, called in the hieroglyphs *Sa*, and existing at the time of the old monarchy, was situated on the right bank of the Canopic branch of the Nile, in $31^{\circ} 4' \text{ n. lat.}$ It is at present called Sa el Hagar, or Sa of the Stone, from some modern stone buildings in the neighborhood. There are, however, no remains of temples or palaces on the site; all that remains being a wall of unburnt brick 70 ft. in thickness, perhaps the peribolos of the temple. Traces of the Temenos, 720 ft. long, still exist, and of the citadel, but the temples and tombs which stood within the city walls have been completely stripped; many fine statues of basalt of the 26th or Saite dynasty, from this spot, being found in the different collections of Europe. Sais gave its name to a nome, and also to two Egyptian dynasties, the 24th and 26th, founded by natives of the city. The goddesses principally worshiped there were Neith or Minerva, and Ceres or Isis. Neith was said to be the mother of the sun, and is constantly called in the hieroglyphical legends the mistress of Sais; and an inscription in the temple of Neith is said to have declared of her, "I am past, present, and future; no one has lifted my veil; the fruit I have brought forth is the sun." At Sais there was also a sepulcher of Osiris. The tombs of the kings, contrary to Egyptian and resembling the Greek custom, were within the walls. The tomb of Amasis consisted of a stone edifice with columns, and a chamber with doors. Sais was important as a religious capital. Toward the decline of

the monarchy, it rose to great splendor. The 26th dynasty transferred hither the capital of the kingdom. Amasis transported a monolithic shrine of granite from Elephantine to Sais after three years' labor, employing 2,000 men in the undertaking. Solon and Pythagoras visited Sais, and Plato was instructed in its colleges. There seems to have been a considerable Greek population in the city; but although Sais continued to be mentioned after the 26th dynasty, its political importance then declined, and Memphis became the seat of government. The intercourse between Sais and Athens subsequently gave rise to the idea of Athens having been colonized from it. Lepsius, *Briefe*, p. 12; Wilkinson, *Modern Egypt*, vol. i. p. 183; Herodot, ii, 28, 59, 169; Strabo, xvii. p. 801; Champollion, *L'Égypte*, ii. p. 219; *Lettres*, p. 50.

S'AIVAS is the name of one of the three great divisions of Hindu sects. See INDIA. The word designates the votaries of S'iva, and comprises different special sects, which varied in number at different periods of mediæval Hinduism. To judge by the number of shrines dedicated to S'iva in his form as Linga, it would seem that the worship of this deity was the most prevalent of all the modes of adoration; but these temples are scarcely ever the resort of numerous votaries, and they are regarded with comparatively little veneration by the Hindus. In upper India, the worship of S'iva has, indeed, never assumed a popular form. No legends are recorded of this deity of a poetic or pleasing character; the S'aivas, unlike the Vaishnavas, have no works in any of the common dialects, such as the *Rāmāyan'a*, the *Vārttā*, or the *Bhaktamāeā*; no establishments in Hindustan, like Srināth or Puri; and their teachers of repute, like S'ankara (q.v.), are too philosophical and speculative to be really popular. The worship of S'iva seems, therefore, to have been, from a remote period, more that of the learned and speculative classes, than that of the masses of the people. In a renowned work called the *S'ankara-digvijaya*, or the victory of S'ankara over the world, composed by Anandagiri, one of the disciples of S'ankara, several subdivisions of the S'aivas are named—viz., the *S'aivas*, properly so called—who wore the impression of the Linga on both arms—the *Raudras*, who had a trident stamped on the forehead; the *Ugras*, who had the drum of S'iva on their arms; the *Bhāktas*, with an impression of the Linga on their foreheads; the *Jangamas*, who carried a figure of the Linga on their head; and the *Pās'upatas*, who imprinted the same symbol on the forehead, breast, navel, and arms. The present divisions of the S'aivas, however, are the following: The Dan'd'ins and Das'nāmi-Dandins; the Yogins; the Jangamas; the Paramahansas; the Aghorins; the Urdhabāhus; Akās'mukhins and Nakhins; the Gūdaras; the Rūkharas, Sūkharas, and Ukharas; the Kārālingins; the Brahmachārins; and the Nāgas.

The *Dan'd'ins*, or staff-bearers, properly so called, are the representatives of the fourth order, or mendicant life, into which a Hindu is to enter after he passed through the stages of a religious student, householder, and hermit. The Dan'd'in is distinguished by carrying a *dan'd'a*, or small staff, with several projections from it, and a piece of cloth dyed with red ochre—in which the Brahmanical cord is supposed to be enshrined—attached to it. He shaves his hair and beard, wears only a cloth round his loins, and subsists on food obtained ready dressed from the houses of the Brahmans once a day only, which he deposits in the small clay pot that he always carries with him. He should live alone, and near to, but not within a city; this latter rule, however, is rarely observed. The genuine Dan'd'in is not necessarily of the S'aiva sect; but those who worship S'iva, especially in his form as Bhairava, or the Terrific, have, at the ceremony of initiation, a small incision made on the inner part of the knee, the blood drawn by this process being deemed an acceptable offering to the god. The *Das'nāmi-Dan'd'ins* are included in this class; but they admit none but Brahmans into their body, and are considered to be the descendants of the original members of the fraternity, who refer their origin to the celebrated *S'ankara* or *S'ankarāchārya* (q.v.). He is said to have had four disciples, who are called Padmapāda, Hastāmalaka, Sures'wara or Mandana, and Trot'aka. Of these, the first had two pupils, Tirtha and As'rāma; the second two, Vana and Aran'ya; the third had three, Saraswatī, Purī, and Bhārati; and the fourth had also three, Giri or Gir, Pāravata, and Sāgara. These ten constitute collectively the *Das'nāmi* (from *das'an*, ten, and *na'man*, name); and when a Brahman enters into either class, he attaches to his denomination that of the class of which he becomes a member; as Tirtha, Giri, etc. The philosophical tenets of this sect are mainly those of the *Vedānta* (q.v.), as taught by S'ankara and his disciples; but they generally superadd the practice of the *Yoga* (q.v.), and many of them have adopted the doctrines of the *Tantras* (q.v.).

The *Yogins* are, properly speaking, followers of the *Yoga* (q.v.) system; and the term implies a class of men who practice the most difficult austerities, in order to become absorbed into the universal spirit, and thus liberated from repeated births. The votaries of S'iva, so called, hold that, by dint of these practices—such as continued suppressions of respirations, sitting in 84 different attitudes, fixing the eyes on the top of the nose—they will be finally united with S'iva, whom they consider as the source and essence of all creation. The principal sect of this class is that of the *Kānpātā Yogins*, who trace their origin to a teacher named *Gorakhnāth*, who seems to have lived in the beginning of the 15th c., and, according to his followers, was an incarnation of S'iva. A temple of *Gorakhnāth* exists at Gorakhpur; a plain, called *Gorakhhethr*, is near Dwārakā, and a cavern of his name at Haridwār. The Yogins of *Gorakhnāth* are called *Kānpātās*,

from having their ears bored and rings inserted in them at the time of their initiation. They may be of any caste; they live as ascetics, single or in colleges; officiate as priests of Śiva in some places; mark the forehead with a transverse line of ashes, and smear the body with the same substance; they deal in fortune-telling, profess to cure diseases with drugs and spells; and some play and sing and exhibit animals.

The *Jangamas*, or *Lingavats*, are likewise not an important division of the Śaiva sect. Their essential characteristic is the wearing of the Linga emblem on some part of their dress or person.

The *Paramahansas* are ascetics who pretend to be solely occupied with the investigation of Brahman, and to be equally indifferent to pleasure or pain, insensible of heat or cold, and incapable of satiety or want. In proof of this, they go naked in all weathers, never indicate any natural want, and receive from their attendants what is brought to them as their alms or food.

The same apparent worldly indifference characterizes the *Aghorins*; but they seek occasions for its display, and demand alms as a reward for its exhibition. Their practices, too, seem to betray that originally their worship was not of an inoffensive kind, but required even human victims for its performance. They eat and drink whatever is given to them, even ordure and carrion; and in order to extort money from the credulous, they resort to the most disgusting devices.

The *Ūrhabāhus* are solitary mendicants; they extend one or both arms above their heads till they remain of themselves thus elevated. They also close the fist, and the nails being suffered to grow, completely perforate the hand. They usually assume the Śaiva marks, and twist their hair so as to project from the forehead, in imitation of the matted hair of Śiva.

The *Ākās mukhins* hold up their faces to the sky till the muscles of the back of the neck become contracted and retain it in that position.

The peculiarities of the other sects we cannot afford space to specify; they are equally trifling and sometimes disgusting. For fuller details on the Śaivas, see H. H. Wilson, *A Sketch of the Religious Sects of the Hindus*; Works, vol. i. (edited by Dr. R. Rost, Lond. 1862), pp. 188, ff.

ŚĀKA. See Ś'ĀLIVĀHANA.

ŚĀKATĀYANA is the name of a celebrated Hindu grammarian, who preceded Pāṇini (q.v.) and Yāska (see NIRUKTA), for he is quoted by both these authors. His grammatical work, however, seems to be lost, for no portion of it has as yet been forthcoming; and an attempt recently made to identify with it a grammar of a Śākatāyana, copies of which are met with at the India office library, London, and at Madras, has signally failed. The latter Śākatāyana is a Jaina (q.v.), who is not only later than Kātyāyana (q.v.), but, in all probability, a modern writer.

SAKHALIN, commonly written SAGHALIEN, native name TARAİKA, a long and narrow island, runs from n. to s. close off the shores of Asiatic Russia, in the s.w. of the Sea of Ochotsk. It formerly belonged partly to Russia and partly to Japan, but the whole of the island now belongs to Russia, Japan having surrendered its portion in 1875. The estimated area is 29,336 sq. m. Pop. '94, 26,500. It is 620 m. in length, and about 90 m. in extreme breadth. Lat. 45° 57'–54° 24' n. In lat. 52° the island approaches to within 6 m. of the mainland, from which it is separated by the shallow Mamia strait. A mountain-chain with craggy summits, which in lat. 52° are covered with snow throughout the year, traverses the island from n. to south. There are no important natural harbors. Of late years Sakhalin has been used as a convict station. The rivers and the coasts swarm with fine fish. Immense stores of fish are preserved in a frozen state during winter, and upon these the natives and their dogs in great part subsist. On the e. coast of the island the vegetation, especially in the n., has a stunted appearance. On the w. coast luxuriant grass clothes the valleys, and forests of pine, fir, birch, larch, oak, and maple trees cover the mountains. Among the animals are the reindeer, the stag, roe, elk, and musk ox. In the northern part of Sakhalin the climate is even more rigorous than at Nikolaevsk (q.v.). The inhabitants carry on an inconsiderable barter trade with their fish, furs, and seals. Coal has been discovered in several localities and explored by the Russians. Ravenstein's *Russians on the Amur* (Trübner & Co., Lond. 1861).

SAKHALIN ULA HOTUN, now commonly and more properly called Aigun, a t. of Manchouria in the Chinese empire, on the right bank of the Amur. Lat. 50° 5' n., long. 127° 28' east. It is the chief place of the Manchoo on the Amur, and is somber in appearance, though it contains many gayly painted temples. The great quadrangle, containing the government and other buildings, is square, and is surrounded by double rows of palisades. The town has been made a naval station. Paper lanterns hang across the streets, and fantastic figures, dragons, etc., cut in paper, are fixed to poles above the shops. Millet, tobacco, and other products are grown in the vicinity for export. Pop. 15,000.

SAKI, a kind of beer which the Japanese make from rice. It is the common alcoholic liquor of Japan. It is clear, and has a peculiar taste, which Europeans generally

reckon unpleasant. The Japanese usually heat it before drinking, and pour it into flat cups or saucers of lackered wood. It produces a very speedy and transient intoxication. See BEER.

SAKI, *Pithecia*, a genus of American monkeys, having the tail, which is not prehensile, covered with very long hair, whence they are often called *fox-tailed monkeys*. The head is round, and the muzzle short, the ears not unlike those of the human race. The whole body is covered with long hair.

S'ÂKTAS is the name of one of the great divisions of Hindu sects (see INDIA). The term is derived from the Sanskrit *s'akti*, which means "power, energy;" but, in its special application, denotes the energy of the deity, and particularly that of the gods of the Hindu triad, Brahma, Vishn'u, and S'iva. This energy, originally spoken of as the wish or will of the Supreme Being to create the universe, and afterward dilated upon in metaphorical and poetical speech, assumed at the Pauranik period (see *Hindu Religion* under INDIA) the form of a separate deity, thought of as the wife of the god to whom it belongs. Accordingly, Saraswatî became the S'akti or wife of Brahman; Lakshmi (q.v.), the S'akti or wife of Vishn'u; and Devî, or Durgâ, or Umâ (q.v.), the S'akti or wife of S'iva. *S'âkta*, properly speaking, means, therefore, a worshiper of any of these female representations of the divine power; but, in its special and usual sense, it is applied to the worshiper of the female energy or wife of S'iva alone; and the Sâktas, properly so called, are, therefore, the votaries of Durgâ, or Devî, or Umâ (q.v.). Since S'iva (q.v.) is the type of destruction, his energy or wife becomes still more so the type of all that is terrific; and, in consequence, her worship is based on the assumption that she can be propitiated only by practices which involve the destruction of life, and in which she herself delights. That such a worship must lead to the brutalization, and degenerate into the grossest licentiousness, of those addicted to it, is but natural; and it will easily be understood that the S'âkta religion became the worst of all forms which the various aberrations of the Hindu mind assumed. Appealing to the superstitions of the vulgar mind, it has its professors, chiefly among the lowest classes; and, among these again, it prevails especially in Bengal, where it is cultivated with practices even scarcely known in most other provinces. The works from which the tenets and rites of this religion are derived, are known by the collective term of *Tantras* (q.v.), but as in some of these works the ritual enjoined does not comprehend all the impure practices which are recommended in others, the sect became divided into two leading branches, the *Dakshin'âchârins* and *Vâmâchârins*, or the followers of the right-hand and left-hand ritual.

The *Dakshin'âchârins* are the more respectable of the two. They profess, indeed, to possess a ritual as pure as that of the Vedas. Nevertheless, they annually decapitate a number of helpless animals, especially kids, and in some cases pommel the animal to death with their fists, or offer blood without destroying life—practices contrary to the Vedic ritual. The *Vâmâchârins*, on the other hand—the type of the S'âkta—and among these especially that branch called Kaula or Kultna, adopt a ritual of the grossest impurities. Their object is, by reverencing Devî, who is one with S'iva, to obtain supernatural powers in this life, and to be identified after death with S'iva and his consort. "According to the immediate object of the worshiper," Professor Wilson says, "is the particular form of worship; but all the forms require the use of some or all of the five letters M—viz., mânsa, matsya, madya, maithuna, and mudrâ—i.e., flesh, fish, wine, women, and certain mystical gesticulations. Suitable *mantras* (or formulas) are also indispensable, according to the end proposed, consisting of various unmeaning monosyllabic combinations of letters, of great imaginary efficacy. Where the object of the ceremony is to acquire an interview with, and control over, impure spirits, a dead body is necessary. The adept is also to be alone, at midnight, in a cemetery or place where bodies are burned or buried, or criminals executed; seated on the corpse, he is to perform the usual offerings, and if he does so without fear, the Bhûtas, the Yoginis, and other male or female goblins, become his slaves. In this, and many of the observances practiced, solitude is enjoined; but all the principal ceremonies comprehend the worship of S'akti, and require for that purpose the presence of a female as the living representative and type of the goddess. This worship is mostly celebrated in a mixed society, the men of which represent Bhairava (or S'iva as the Terrific), and the women, Bhairavî (S'akti or Devî as the Terrific). The S'akti is personated by a naked female, to whom meat and wine are offered, and then distributed among the assistants; the recitation of various mantras and texts, and the performance of the mudrâ, or gesticulations with the fingers, accompanying the different stages of the ceremony; and it is terminated with the most scandalous orgies among the votaries." The same author adds that, "in justice to the doctrines of the sect, it is to be observed, that these practices, if instituted merely for sensual gratification, are held to be as illicit and reprehensible as in any other branch of the Hindu faith;" but full assent must be given to his remark which follows a text quoted by him in support of this view, for he says: "It is only to be added that if the promulgators of these doctrines were sincere, which is far from impossible, they must have been filled with a strange frenzy, and have been strangely ignorant of human nature."

"The members of this sect are very numerous, especially among the Brahmanical

caste: all classes are, however, admissible, and equal at the ceremonies of the sect. The particular insignia of these Sāktas are a semicircular line or lines on the forehead, of red sanders or vermilion, or a red streak up the middle of the forehead, with a circular spot of red at the root of the nose. They use a rosary made of the seeds of the eleocarpus, or of coral beads, but of no greater length than may be concealed in the hand; or they keep it in a small purse, or a bag of red cloth. In worshipping, they wear a piece of red silk round the loins, and decorate themselves with garlands of crimson flowers." Two other sects are likewise mentioned as belonging to the Sāktas, the *Kāñchulīyas* and *Kardrins*, but it is doubtful whether they are still in existence. The former are said to have belonged to the s. of India; and the latter seem to have been worshippers of Devi in her terrific forms, the offering to her of human sacrifices being the principal feature of their ritual. If there are still any votaries of this sect, Professor Wilson believes that they are the miscreants who, more for pay than devotion, at certain festivals, inflict upon themselves bodily tortures, such as piercing their flesh with hooks or spits, reclining upon beds of spikes, gashing themselves with knives, etc.—See H. H. Wilson, *A Sketch of the Religious Sects of the Hindus*; Works, vol. i. (edited by Dr. R. Rost, 1862), pp. 240, ff.

SAKUNTALA is one of the most pleasing female characters of Hindu mythology. She is mentioned as a water-nymph in the *Yajurveda* (see VEDA); she is the subject of a beautiful episode of the *Mahābhārata* (q.v.), and is spoken of in the *Purāṇas*; but her name has become especially familiar in Europe through the celebrated drama of Kālidāsa (q.v.), which, introduced to us by sir William Jones in 1789, became the starting-point of Sanskrit philology in Europe. The principal features of the legend of Sakuntala, as narrated in the *Mahābhārata*, are the following: Sakuntala was the daughter of the saint Vis'va'mitra (q.v.) and the Apsaras, or water-nymph, Menakā. Abandoned by her parents, she was adopted by the saint Kan'wa, who brought her up in his hermitage as his daughter. Once upon a time, king Dushyanta went a-hunting in the forest, and accidentally coming to the hermitage of Kan'wa, saw Sakuntala, and fell in love with her. He persuaded her to marry him according to the rite of the Gandharva marriage, and promised her that the son she would bear him should be the heir to his throne, and that he would take her home as his queen to his royal city. Kan'wa, who had been absent while this event happened, returned to the hermitage, and through his divine knowledge knew the whole secret, though it had not been confessed to him by Sakuntala. She in due time was delivered of a son, and remained at the hermitage until the boy was six years old; but as Dushyanta, unmindful of his promise, did not send any messenger for her Kan'wa directed her to proceed with her boy to the residence of Dushyanta. This she did; but when she arrived at his residence, she was repudiated by the king. Nor did her speech, however touching and eloquent, move his heart, until at last a heavenly voice assured him that Sakuntala had spoken the truth, and that he saw before him his lawful son. Thereupon, Dushyanta recognized Sakuntala as his queen, and her son as his heir. The latter was named Bhārata, and became the founder of the glorious race of the Bhāratas. In the drama, Kālidāsa's genius had full scope to work out the incidents of this legend, so as to display the accomplished female character of Sakuntala, and likewise to show that the obstacle which arose to her recognition was not the fault of Dushyanta, but the consequence of a curse which Sakuntala had incurred from a wrathful saint who, when once on a visit to Kan'wa's hermitage, had considered himself neglected by her. Since, in the drama, Dushyanta recognizes Sakuntala by means of a ring he had given her at the hermitage, the name of the drama is *Abhijñāna-Sakuntala*, or "the drama in which Sakuntala [is remembered] by a token." There are two versions in which this drama now exists—an older and a more recent one. The latter was first edited at Calcutta, 1761, then at Paris, 1830, by A. L. Chézy, who also gave a French translation of it; later and better editions of it (Cal. 1860 and 1864) were prepared by the Pandit Prem Chunder Tarkabāgish, under the superintendence of Prof. Edward B. Cowell, the principal of the Sanskrit college at Calcutta. The older version has been edited by Dr. O. Boettlingk (Bonn, 1842), by Prof. M. Williams (Hertford, 1853), and by a Bombay pandit at the Induprakāśa press (Bomb., 1861). The first English translation of it is that by sir William Jones (Cal., 1789); the second was made by Prof. M. Williams (Hertford, 1856); it deserves the highest acknowledgment, on account of the consummate taste with which it has rendered the metrical part of the original. Among the various German, Italian, Danish, and other translations of this drama, the German translation by Ernst Meyer (Stutt., 1852) is worthy of especial notice.

SĀKYAMUNI, or the SAINT SĀKYA, is a name of the Buddha, the founder of the Buddhist religion. See BUDDHISM.

SAL, *Vateria robusta*, a tree of the natural order *dipteraceæ*, one of the most valuable timber trees of India. Great sal forests exist along the southern base of the Himalaya mountains, but in many places they have been nearly cut down. The care of government is now extended to their preservation.

SALA, GEORGE AUGUSTUS HENRY, b. London, 1828; son of an Italian who married a favorite English singer of West Indian extraction. He was educated to be an artist, but devoted himself to literature. He became a contributor to *Household Words*, the

Welcome Guest, the *Illustrated London News*, *All the Year Round*; and was the founder and first editor of the *Temple Bar Magazine*. He came to America in 1863 as special correspondent for the *Daily Telegraph* of London; and in 1864 published *America in the Midst of the War*. He acted as correspondent to the same paper in Algeria in 1864 and 1875; at the Paris exposition 1867; during the Franco-German war 1870-71; in Spain, Morocco, and Venice 1875; and in Russia 1876. In 1879 he visited America as a lecturer. He has published, among other works: *A Journey Due North*; *Twice Round the Clock*; *Seven Sons of Mammon*; *Strange Adventures of Captain Dangerous*; *From Waterloo to the Peninsula*; *Notes and Sketches of the Paris Exposition*; *Rome and Venice*; and *Under the Sun*. He re-visited the U. S., on a lecturing tour, 1885. D. 1896.

SALAAM (*Selâm*, Arab. = Heb. *Shalom*, peace), the general term of salutation among the Mohammedans. They are generally very formal in their social manners, although their demeanor and conversation are unrestrained enough, both among men and women. Several of their social usages in this respect are founded upon religious precepts; among these is the custom of greeting each other with the words: "*Es-selamu aleikum*" (Peace be with you), which is answered by: "With you be peace, and the mercy of God, and his blessings!" This salutation is neither to be addressed to nor to be received from any non-Mohammedan. The reply, when one Moslem salutes another, is obligatory, while the address itself is rather arbitrary. Should the saluted refuse to reply, then the other may revoke his salutation, as he does in the case of his discovery that the person saluted is not a true believer, with the words: "Peace be on us and on all the righteous worshippers of God." Generally the rider salutes the person on foot, the passer-by those who sit down or stand still; the smaller party salutes the larger, the young the older, etc. Salutation is to be the first and the last thing on entering a house. The following is the rising scale of the different modes of obeisance with the Moslem: 1. Placing the right hand upon the breast; 2. Touching the lips and the forehead or turban (or forehead and turban only) with the right hand; 3. Doing the same, but slightly inclining the head during that action; 4. The same, but inclining the body also; 5. The same, previously touching the ground with the right hand; 6. Kissing the hand of the person to whom the obeisance is paid; 7. Kissing his sleeve; 8. Kissing the skirt of his clothing; 9. Kissing his feet; 10. Kissing the ground. This, however, is to be understood (against De Sacy) as merely touching the ground previous to touching the lips and forehead with the right hand. The first five modes are accompanied by the "Peace be with you," and the reply given above. The sixth mode is observed by servants or pupils to their master, wife to husband, and children to father, and sometimes mother, by the young to the aged, and the less learned to the learned and pious (Lane, *Notes to Arab. Nights*, etc.).

SALAD, the name given to a preparation of raw herbs for food. It derives its name from the fact that salt is one of the chief ingredients used in dressing a salad. The principal salad herbs are lettuce, endive, chicory, celery, mustard, and cress; water-cress, onions, radishes, chervil, and a few savory herbs used to give flavor. They are usually cut up and mixed with salt, vinegar, oil, and other condiments, according to taste. Sugar is also frequently added. Cresses, seed-leaves of mustard, etc., are often eaten without any addition. Salad has always been a favorite food with civilized nations, and has very little varied in its composition. The Romans used it, and made it thus: Cultivated endive was cut small after careful washing and draining, then gravy and oil were poured over it, and finely-minced onions were strewed over the whole, then a little vinegar and honey was added, and the salad served up. The great value of salads is in the fact that they are uncooked, and consequently contain a larger quantity of mineral matter, such as potash, soda, etc., than if boiled. Salads are sometimes prepared with animal food, such as boiled lobsters, crabs, eggs, etc.

SALADIN, the name given by western writers to SALAH-ED-DIN YUSSUF IBN AYUB, the sultan of Egypt and Syria, and the founder of the Ayubite dynasty in those countries. As the great Moslem hero of the third crusade, and the beau ideal of Moslem chivalry, he is one of the most interesting characters presented to us by the history of that period. He belonged to the Kurdish tribe of Ravad, and was born at Tekreit (a town on the Tigris, of which his father Ayub was *kutubal* or governor under the Seljuks) in 1137. Following the example of his father and uncle, he entered the service of Nouredin (q.v.), prince of Syria, and accompanied his uncle in his various expeditions to Egypt in command of Nouredin's army. Saladin was at this time much addicted to wine and gambling, and it was not till at the head of a small detachment of the Syrian army he was beleaguered in Alexandria by the combined Christians of Palestine and Egyptians that he gave indications of possessing the qualities requisite for a great captain. On the death of his uncle Shirko, Saladin became grand-vizier of the Fatimite caliph, and received the title of *El-melek-el-nasr*, "the victorious prince;" but the Christians of Syria and Palestine, alarmed at the elevation of a Syrian emir to supreme power in Egypt, made a combined and vigorous attack on the new vizier. Saladin foiled them at Damietta, and transferred the contest to Palestine, taking several fortresses, and defeating his assailants near Gaza; but about the same time his newborn power was exposed to a still more formidable danger from his master, Nouredin, whose jealousy of the talents and ambition of his able young lieutenant required all the skill and

wariness at Saladin's command to allay. On Nouredin's death in 1174, Saladin began a struggle with his successor, which ended in his establishing himself as the sultan of Egypt and Syria, a title which was confirmed to him by the caliph of Bagdad. The next ten years were occupied in petty wars with the Christians, and in the arrangement and consolidation of his now extensive dominion. The plundering by the Christians of a rich pilgrim caravan on its way to Mecca, an infringement of the treaty with Saladin, brought down upon them the latter's vengeance; their army suffered a dreadful defeat at Tiberias (July 4, 1187); the king of Jerusalem, the two grand-masters, and many other warriors of high rank were taken captive; Jerusalem was stormed (Oct. 2), and almost every other fortified place in Palestine was taken. The news of this great success of the infidels being brought to western Europe, aroused the enthusiasm of the Christians to its highest pitch, and a powerful army of crusaders, headed by the kings of France and England, speedily made their appearance on the scene of strife. They captured Acre in 1191, and Richard Cœur-de-Lion, at the head of that portion of the crusading army which adhered to him, continued the war with success, twice defeated Saladin, took Cæsarea and Jaffa, and finally obtained a treaty for three years (Aug., 1192), by which the coast from Jaffa to Tyre was yielded to the Christians. In the following year Saladin died at Damascus of a disease under which he had long suffered. Saladin was not a mere soldier; his wise administration left behind it traces which endured for centuries; and the citadel of Cairo and sundry canals, dikes, and roads are existing evidences of his careful attention to the wants of his subjects. In him the warrior instinct of the Kurd was united to a high intelligence; and even his opponents frankly attribute to him the noblest qualities of mediæval chivalry, invincible courage, inviolable fidelity to treaties, greatness of soul, piety, justice, and moderation.

The Ayubite dynasty of which he was the founder ruled over Syria till 1259, when it was dispossessed by the Perso-Mongols, and over Egypt till the rise of the first Mameluke kingdom under Ibeg in 1250.

SALADO RIVER, in the Argentine Republic, rises in the n.w. of the province, flows s.e., and after a course of about 600 m. empties into the Paraná below Santa Fé. It is navigable below the Salta lowlands, and has a total length of about 1120 m.

SALAMANCA, one of the three modern provinces of Spain into which the ancient kingdom of Leon (q.v.) was divided. Area, about 4,940 sq. m.; pop. '87, 314,424.

SALAMANCA, a famous t. of Spain, capital of the modern province of the same name, stands on three rocky hills on the right bank of the Tormes, 67 m. s.w. of Valladolid. Prior to its almost total destruction by the French in 1812, it was renowned for the number of its splendid edifices and institutions, and even yet it is a rich mine for the architect, abounding as it does in magnificent specimens of simple and florid Gothic, as well as of the richest cinque-cento. It is surrounded by a wall pierced with nine gates, and a part of which is very old. The narrow, crooked, dark, and steep streets, containing many old and stately structures, the residences of the old nobility, give to the town an antique and venerable look. Besides the old cathedral, a simple and massive edifice, it contains five other churches of the 12th century. The new cathedral, begun in 1513, is a magnificent structure in florid Gothic, in the adornment of which painting, gilding, and sculpture have been largely and most successfully used. At the close of the 18th c. Salamanca contained 27 parish churches, 39 convents, and 25 colleges. Of the colleges, 20 were destroyed by the French while the town was in their possession, as well as about 20 of the convents, for the purpose of obtaining materials for the erection of fortifications, and for firewood. The university of Salamanca, with which the university of Palencia (q.v.) was incorporated in 1243, was founded in 1200. It consisted of a number of colleges, divided into *mayores* and *menores*, or larger and smaller colleges. Of the former, there were only six in Spain, and four of these were at Salamanca: the other colleges were 21 in number. In the 14th c. the university was attended by 17,000 students. The library, according to the most recent statements, contains 60,000 volumes and MSS. The school of Salamanca is interesting to British subjects as having, from an early period, included a college for Irish students, which supplied many of the ecclesiastics who continued to minister to their countrymen during the penal times, and which is still in existence. One of the most highly-prized works in Roman Catholic divinity is the great collection of controversial and moral theology, by the members of the college of Carmelite friars in Salamanca, who are known by the name of *Salmanticenses*, or the *Salamanca theologians*. The *Plaza Mayor* is the largest square in Spain, and when fitted up as a bull arena, as it was so recently as 1863, it accommodates from 16,000 to 20,000 persons. The bridge across the Tormes is of Roman foundation. The Colegio Viego is the provincial museum. Manufactures of cloth, leather, and earthenware are carried on. Pop. '87, 22,199.

Salamanca, the ancient *Salmantica*, was a Roman *municipium*. In the vicinity was won one of the most famous victories of the peninsular war, by the British under Wellington against the French under Marmont, July 22, 1812.

SALAMANDER, in the superstitions of the middle ages, denoted a being possessing the shape of a man, whose element was the fire, or who at least could live in that element. Paracelsus placed salamanders among the elementary spirits.

SALAMANDER, *salamandra*, a genus of batrachians, of the family *salamandridæ*, to which newts (q.v.) also belong. The name is, indeed, sometimes extended to the whole family; newts being called *aquatic salamanders*, and the name *terrestrial salamander* being given to this genus, the species of which inhabit water only in their tadpole state, and return to it only to deposit their eggs, generally living in moist places, as under stones, roots of trees, etc. The general form is very similar to that of newts, but the tail is round, not flat as in newts. Several species are found in Europe; none of them, however, in Britain. The **SPOTTED SALAMANDER** (*S. maculosa*), 6 or 8 in. long, black, with bright yellow stripes on its sides, and livid blue beneath, is widely spread throughout Europe. The **BLACK SALAMANDER** (*S. atra*) is much smaller, black, the body and tail ringed, the tail almost as if formed of beads. It is abundant in the Alps and mountains of southern Germany. Other species are found in Spain, Italy, etc.; Asia and North America also produce numerous species. Salamanders feed on worms, slugs, snails, and insects. They are inert and sluggish creatures, and timid to the utmost extent that their stupidity permits. The brain is very small. They are perfectly harmless, although exuding, when alarmed, from pores on the back and sides, a milky humor, which is injurious to very small animals. But they have long had, and still retain, a popular reputation of extreme venomousness, and are therefore objects of the utmost dread to the vulgar in almost all countries which they inhabit. Strange fables have been current concerning them from remote ages, particularly concerning the icy cold which envelops their body and enables them not only to endure fire without burning, but to extinguish fire. Pliny, indeed, records that he tried the experiment, and the poor salamander was burned to powder; yet the fable continued to be credited until very recent times. See *illus., REPTILES, ETC.*, vol. XII.

SALAMIS (modern name, *Koluri*), in ancient times called also *Pityoussa* (island of Pines), an irregularly shaped, mountainous island of Greece, off the coast of Attica, and forming with it the bay of Eleusis. Its area is about 30 sq. m., and it has a modern population of about 4,000, the chief town being Koluri, on the w. coast. It had anciently two principal towns, Old and New Salamis, the former on the s., and the latter on the n.e. coast. Salamis is remembered chiefly on account of the great naval battle between the Greeks and Persians, which was fought (480 B.C.) a few days after the battle of Thermopylæ, in the narrow strait between the e. coast of Salamis and the w. coast of Attica. The Grecian fleet, consisting of about 360 vessels, was drawn up at the entrance of the bay forming the harbor of New Salamis, Themistocles being leader of the Athenian contingent, and Adimantus of the Corinthian, while the whole was under the command of the Spartan Eurybiades. Great dissensions prevailed among the Grecian leaders, which would probably have led to a general break-up, had not Themistocles by a stratagem induced Xerxes, king of the Persians, to bring up his fleet, and give immediate battle to the Greeks. Xerxes drew up his ships, numbering at least 1000, during the night previous to the battle, opposite the Grecian fleet, along the coast of Attica, almost completely blocking up both entrances to the straits; and confident of victory if he himself superintended operations, he took his seat on a throne erected on a lofty height on the Attic coast, almost opposite New Salamis. Both Greeks and Persians fought with great bravery, but the latter were entirely defeated, owing, perhaps, chiefly to their immense, unwieldy fleet being compressed into so small a space, which rendered it almost unworkable, and completely at the mercy of their opponents. The only name mentioned on the Persian side with distinction is that of Artemisia, queen of Halicarnassus, who is said to have fought with desperate bravery. The loss of the Greeks is said to have been 40, and that of the Persians 200 ships, exclusive of those which were captured.

SAL AMMO'NIAC (known in chemistry as **HYDROCHLORATE OF AMMONIA**) is an article of considerable importance in the *materia medica*. It is obtained on a large scale by decomposing with common salt (chloride of sodium) the sulphate of ammonia, which is formed in the manufacture of coal gas, or the carbonate of ammonia, obtained by the distillation of bones. It is sold in large, crystalline, grayish-white, semi-transparent cakes, convex on one side, and concave on the other. It is inodorous, but possesses an acrid, bitter, and nauseous taste. Its specific gravity is 1.45; it volatilizes without decomposition when heated, and is freely soluble in water. Its aqueous solution, when heated with caustic potash, evolves gaseous ammonia; and when treated with nitrate of silver, yields a white, curdy precipitate of chloride of silver. This salt is largely given in France and Germany in cases of pneumonia and of inflammation of the serous membranes, in mucous diarrhæa, in chronic rheumatism and gout, and in passive dropsies. Neligan recommends it in cases of low fever, in subacute laryngitis, in chronic affections of the liver, and in facial neuralgia. It may be given in doses varying from 10 to 30 grains, dissolved in some aromatic water. As a local external application, it is of great value in promoting the absorption of effused blood; and there is probably no remedy so effectual for that common but disfiguring affection popularly known as a *black eye*, as a moderately strong solution of this salt, kept constantly applied as a lotion. If it is desired to apply cold to any part of the body, an excellent refrigerant (q.v.) may be obtained by dissolving 5 parts of this salt and 5 parts of niter in 16 parts of water.

Sal ammoniac is employed for various purposes in the arts. It is used in soldering,

and in the tinning of copper and iron to prevent the oxidation of the surface to be tinned. It is also used in large quantities in electric batteries of the open circuit type.

It occurs as a mineral, as an efflorescence on the surface of rocks, or as a sublimate in fissures, crystallized in small crystals, or forming crusts, stalactites, etc. It is found in volcanic regions, but is produced during the time of the quiescence of active volcanoes, rather than during their eruptions. It occurs in Britain, near burning beds of coal. It is found in Persia, Tartary, Siberia, and many other countries, where there are no active volcanoes. Formerly all Europe was supplied with it from the neighborhood of the temple of Jupiter Ammon in Egypt, whence its name.

SALDANHA BAY. See CAPE OF GOOD HOPE.

SALDANHA, JOÃO CARLOS, OLIVEIRA E DAUN, Duke of, 1791–1876; b. Portugal; educated at Coimbra. In 1810 he was a prisoner in England. On his release he visited Brazil, where he was employed in the military and diplomatic services. Returning to Portugal, he became minister of foreign affairs in 1825, governor of Oporto in 1826, and minister of war till 1837. In 1833, with the duke of Terceira, he overthrew the usurper dom Miguel. In 1835 he was made minister of war and president of the council; in 1846 he formed a ministry, which fell in 1849. He was again at the head of affairs 1851–56, was minister to Rome 1862–64, and 1866–69, and was again head of the cabinet May–Aug., 1870.

SALE, GEORGE, an eminent oriental scholar, was b. toward the end of the 17th c., and died at London in 1736 under 40 years of age. Almost nothing is known of his private life. He is supposed to have been born in Kent; and he received his education at the King's college, Canterbury. Brought up to the law, he is believed to have practiced it almost to the end of his life. That he spent 25 years in Arabia, as Voltaire and many after him asserted, is a complete fiction. He assisted in getting up the *Universal History*—together with Swinton, Shelvocke, Campbell, George Psalmanazar, and A. Bower, each remarkable enough in his way—for which he wrote the cosmogony and several portions of oriental history. He was also one of the authors of the *General Dictionary*; but he is best known by his unrivaled translation of the Koran, “with explanatory notes taken from the most approved commentators, to which is prefixed a preliminary discourse” (1734). This “preliminary discourse,” which is of great value, and proves Sale to have been deeply versed in oriental literature, treats, among other things, “of the Arabs before Mohammed, or, as they express it, in the “time of ignorance”—their history, religion, learning, and customs; of the state of Christianity, particularly of the eastern churches, and of Judaism, at the time of Mohammed's appearance; and of the methods taken by him for establishing his religion, and the circumstances which concurred thereto; of the doctrines, precepts, and peculiarities of the Koran, and of the principal Mohammedan sects.” Sale's work was translated into French by Duryer (Antw. 2 vols. 1770). This translation formed a new epoch in the study of Islam and its literature; and though many other translations have been attempted since, in nearly all European and oriental languages, it still bears the palm. See KORAN. That his contemporaries fastened the charge of heresy upon one who spoke philosophically and humanely of other creeds, is not to be wondered at. After his death, a catalogue of his oriental MSS. was published, and the contents are now in the Radcliffe library, Oxford.

SALE, Sir ROBERT HENRY, 1782–1846, b. England. A commission in the army was given him when a mere child, and he was engaged in the storming of Seringapatam in 1799. He was also present at the victories of Travancore, 1809; Mauritius, 1816; and Rangoon, 1824; in 1838 was given command of a brigade in the Afghanistan expedition, and was wounded while leading the storming party at Ghuznee. For his gallant conduct he was knighted and made maj.gen. (local rank). In 1841 he was driven back upon Jellalabad, where he was besieged by Akhbar Khan for five months. In April, 1842, he made a sortie and routed the Afghans. He was given a vote of thanks by parliament, and became known as the “hero of Jellalabad.” Sir Robert took part in the actions of Teezen and Cabool, was quartermaster in the Punjab campaign, and was mortally wounded at the battle of Moodkee, Dec. 18, 1845.

SALE, or SLA. See SALLEE.

SALE OF GOODS AND OF LAND. The term sale, though applied in ordinary language to the transfer of real property, properly applies only to the transfer of personal property. As to the transfer of real estate, see CONVEYANCING and titles there cited. To make a valid sale requires three things: 1. A thing to be sold. Though if one sell a thing which was destroyed at the time of the sale, there is no sale; so if a mistake were made as to the thing sold. 2. A price agreed upon; and this price must be certain, though it may be left to a third person to fix it; it must be fixed in money, or the transaction is a barter. 3. The consent of the parties to the contract, i.e., an agreement on the part of the seller to sell a certain thing to the buyer for a certain price, and of the buyer to buy the same thing for the same price. In the absence of evidence of a sale on credit, an agreement for instant payment is presumed; in default of which the vendor may recover the goods. If the goods have been actually delivered, and part payment or earnest made by the seller, the presumption of payment is rebutted; but though

earnest be accepted, the vendee cannot take the goods, unless that be a condition of sale, and if he fail to appear within a reasonable time, on request, the vendor may rescind the contract. If, however, the terms of sale expressly agree upon a future payment or delivery, the property vests at once in the vendee. The vendor cannot bring suit for the price till he has made tender, or delivery of the goods. If the price be unpaid, whether the sale be for cash or not, the vendor has a lien upon the goods for the price while he keeps possession of them; but he loses his lien by delivering the goods. A sale unaccompanied by a delivery is not good against an innocent third purchaser without notice. Delivery is not necessary for the validity of the agreement as between vendor and vendee; but as between the vendor and his creditors, want of delivery is a strong, though not conclusive, evidence of fraud. If the goods be of such kind that delivery is impossible, a personal possession by the vendee is not necessary. Whenever, in a contract of sale, the parties agree upon the performance of a particular act by either of them, in regard to the object sold, there is a conditional sale. A common instance of it occurs in the case of the so-called "contracts of sale or return" where the vendee receives possession of the chattels, and may either retain them or return them within a time specified; and if he do not return them the sale is complete. As to the sale of goods *in transitu*, in case of bankruptcy or insolvency of the vendee, while the price is unpaid, see STOPPAGE IN TRANSITU.

SALEM, a co. in s.w. New Jersey, bounded by the Delaware River on the w., and drained by several creeks; traversed by the West Jersey and Seashore railroad; 340 sq. m.; pop. '90, 25,151. Co. seat Salem.

SALEM, town and co. seat of Washington co., Ind.; on the Blue river and the Louisville, New Albany, and Chicago railroad; 35 miles n.w. of New Albany. It has a high school, electric lights, waterworks supplied from springs, saw and planing mills, quarries of oölitic limestone, and weekly newspapers. Pop. '90, 1975.

SALEM, city, port of entry, and one of the co. seats of Essex co., Mass.; on Massachusetts bay and the Boston and Maine railroad; 17 miles n.e. of Boston. It is also on the line of electric street railroads connecting with Lynn, Beverly, Danvers, Peabody, and Marblehead.

Salem is the oldest town in New England excepting Plymouth, and has a national fame by reason of its historical interest, and that imparted to it by the romances of Nathaniel Hawthorne. Its site was called Naumkeag by the Indians, and here in 1626 a house was erected by Roger Conant. In 1628 the first regular settlement was made, under John Endicott. The first church was organized in 1629, and the framework of its first edifice, erected in 1634, is still preserved. In 1692 the witchcraft delusion broke out in that part of Salem now called Danvers, and nineteen persons were executed.

In 1774, Oct. 7, in this city, the house of representatives of the province of Massachusetts, with John Hancock in the chair, declared itself an independent political power. At the North Bridge, Feb. 14, 1775, Col. Leslie, the British commander, was foiled in his search for cannon and compelled to return to Boston. More than 150 privateers sailed from this port in the revolutionary war, capturing 445 British vessels.

Salem was incorporated as a town in 1630, and became a city in 1836. The first vessel sent from the United States to Calcutta and China sailed from Salem in 1785, and the trade with those countries was long almost monopolized by her merchants. Trade with Japan, Africa, and Brazil was commenced by Salem merchants also.

The harbor, though safe and spacious, has not sufficient depth of water for large vessels; the foreign commerce has been transferred to Boston and New York; but the coasting trade is extensive, large quantities of coal being landed here, and sent by rail to the interior. The fisheries, which ceased when the East India trade was prosperous, have again become important. Ice is shipped in large quantity.

The chief articles of manufacture are leather, leather machinery, cotton goods, jute, cordage, white lead, lead pipe, castings, chemicals, railroad cars, shoes, shoe stock, trunks, furniture, and glue. The capital employed in 1890 was \$6,250,164, and the value of products was \$8,522,751.

The streets of the city are irregular, and the older ones are narrow. A beautiful park called Washington Square lies in the eastern part, and a cemetery called Harmony Grove is in the western part. A number of ancient houses of historical interest remain, and probably no city in New England contains so many large and handsome houses built in the early years of the nineteenth century. Among the principal public institutions are the Peabody academy of science, the East India marine society, organized in 1799, which has a valuable museum; the Essex institute, organized in 1848, with a large library and collection of portraits and relics; the Salem atheneum, formed in 1810, with its library, occupying, jointly with the Essex institute, Plummer hall; the Essex agricultural society, incorporated 1818; the Essex southern district medical society, formed in 1805; the Marine society instituted in 1766; and the charitable mechanical association, organized in 1817. The city has an almshouse, a hospital, an orphan asylum, a high school, a state normal school for girls, a city hall, a court-house, a custom house, a reformatory, several national and savings banks, electric lights, and the first electric street railroad built in the United States. It is supplied with water from Wenham lake, four miles distant. Pop. '90, 30,801.

SALEM, city and co. seat of Salem co., N. J.; on Salem creek and the West Jersey and Seashore railroad; 32 miles s. of Philadelphia. It contains a high school, a Friends'

preparatory school, the Tyler public library, Y. M. C. A., gas and electric light plants, waterworks supplied by artesian wells, national banks, and about 12 churches. The industrial establishments include several large glass works, oil-cloth factory, iron foundry, hosiery mill, and several fruit and vegetable canneries. Salem is one of the oldest towns in the state, having been settled in 1675. It was chartered as a city in 1860. Pop. '90, 5516.

SALEM, a city in Forsyth co., N. C.; on the Norfolk and Western and the Southern railroads; adjoining the city of Winston, with which it is identical in many respects. It is noted as the seat of a Moravian female seminary, founded in 1802, which retains its original name, although it has long been a popular college. Pop. '90, 2711.

SALEM, city and co. seat of Columbiana co., O.; on the Pennsylvania Co.'s and the Salem railroads, 20 miles s.w. of Youngstown. It has national and private banks, high school, daily and weekly newspapers, electric lights, electric street railroads, and manufacturing of sheet iron, engines, wire nails, pumps, brick and tile, church organs, church furniture, stoves, machinery, etc. Pop. '90, 5780.

SALEM, city, capital of Oregon, and co. seat of Marion co., on the Willamette river and the Southern Pacific railroad; 50 miles s. of Portland. It contains the state capitol, the state penitentiary, the state institution for the blind, the state institution for deaf mutes, the state reform school, and the state insane asylum, and has the Chemawa Indian training school, public hospital, and Masonic and Odd Fellows' libraries. The city is the site of the first Methodist mission in the far west. It is admirably laid out, with streets 100 feet wide and blocks 300 feet square, and has electric lights, electric street railroads, waterworks supplied from the river, over 15 churches, national and state banks, and daily, weekly, and monthly periodicals. The river is navigable during the greater part of the year, and when open the city has daily communication with Portland by steamboat. The city was settled in 1834, incorporated as a city in 1853, and was made the state capital in 1860. Pop. '90, 4515.

SALEM, town and co. seat of Roanoke co., Va.; on the Roanoke river and the Norfolk and Western railroad; 6 miles w. of Roanoke. It is built at the head of the valley of Virginia, between the Blue Ridge and the Alleghany mountains, and is celebrated for the salubrity of its climate and charming scenery; sulphur and chalybeate springs are an additional attraction for summer residents, invalids, and tourists. It is the seat of Roanoke college, Lutheran, founded 1853, with a library, a valuable cabinet, and chemical and philosophical apparatus. The river furnishes water-power, which is utilized by tobacco, woolen, tanning, mineral wool, iron, carriage and wagon, brick, and machine works, and by mills. The town has Baptist and Lutheran orphanages, electric lights and street railroads, national and state banks, loan and trust company, and weekly and monthly periodicals. Pop. '90, 3279.

SALEM, a t. in the s. of India, capital of the district of the same name. The district is the chief seat of the Indian *steel manufacture*—a branch of industry as curious as it is ancient. The town stands in an elevated valley, 1070 ft. above sea level, bounded on the n. and s. with hills, 69 m. n.n.w. of Trichinopoli. It is well built, contains a number of handsome two-storied houses, and is surrounded by land in a high state of cultivation. Cotton is grown in the vicinity and carpet weaving is carried on. A number of iron mines are to be found, and there is limestone in the vicinity. Pop. '91, 67,710.

SALEMI, a t. of Sicily, in the province of Trapani, 41 m. s.w. from Palermo. Pop. about 12,000.

SALEP, the tubers of many species of *orchis* and other *orchideæ*, dried and used as an article of food. Of the two tubers usually found at the roots of these plants, only one is gathered for salep, the younger and more solid of the two. The tubers are gathered when the stalk is about to fall. They vary from the size of a cherry-stone to that of an olive. They are cleaned, dipped for a few minutes in boiling water, and dried as quickly as possible, by which process they are rendered hard and horny. The greater part of the salep of commerce is brought from the east, and much of it from Persia; it is supposed to be obtained from species of *culophia*; but most of the European species of *orchis* are used for it.

Before coffee became so common in Britain, salep was an article of considerable importance, and large quantities were imported from Turkey, Persia, and India. In France it is still in considerable request. For use it is ground into a fine powder, and mixed with boiling water, sugar and milk being added according to taste. As a diet-drink, it was considered very nutritious and wholesome, and forty years ago it was sold, ready prepared, to the working-classes of London early in the morning from the numerous street stalls. Its principal constituents are *bassorine*, starch, and phosphate of lime.

SALERATUS (aerated salt), a name long ago applied to an imperfectly carbonated bicarbonate of potash, made by exposing a neutral carbonate to the action of carbonic acid gas. The salt may be considered as a sesquicarbonate of potash. It has been displaced for culinary purposes by bicarbonate of soda, a more preferable article, and more easily assimilated by the system. See POTASSIUM and SODIUM.

SALERNO (ancient *Salernum*), a city of southern Italy, capital of the province of Salerno, on the gulf of the same name, 9 m. e.n.e. of Amalfi, with a pop. '95 (commune), 36,300.

A Gothic wall, built of huge stones without mortar, encircles it; the streets are paved with lava, and, with the exception of the two principal ones, are narrow, irregular, and dirty. It has a strong castle, and a very small harbor. The old and beautiful Gothic cathedral was erected by the Normans, and has around it a portico of porphyry and granite pillars brought from Pæstum by Robert Guiscard. It has many famous sepulchers, among others, those of Robert and Guillaume Guiscard, of Margaret of Anjou, and of Gregory VII. It was celebrated in the middle ages for its school of medicine (the *Schola Salernitana*), founded by Robert Guiscard about the end of the 11th c., and which was long the first medical school in Europe. The university has fallen into decay. In its neighborhood, which produces excellent wine, are the ruins of Pæstum, which was destroyed by the Saracens in the 9th century. Of ancient Salernum, or Salurnum, there still exist the temple of Neptune, that of Ceres, and the ruins of an amphitheater and of a theater. Salerno was founded by the Greeks; it became important under the Roman empire, then passed into the possession of the Goths, and of the Lombards. Robert Guiscard made himself master of it in 1076. Charles V. united it to the kingdom of Naples.

SALERNO, GULF OF (anc. *Sinus Pæstanus*, on whose shores, in early times, the Greek city of Pæstum [q.v.] stood), is a nearly semicircular indentation on the western shores of southern Italy, s.e. of the bay of Naples, from which it is separated by the promontory ending in Point Campanella. The gulf is 36 m. wide at its entrance, and sweeps inland for 24 miles. On its shores are the towns of Amalfi and Salerno.

SALES, FRANCIS DE, a most distinguished saint of the Roman Catholic church, was b. Aug. 21, 1567, at the family castle of Sales, near Annecy in Savoy. He was the heir of the family honors, and his education was designed by his father to fit him for the career of distinction to which his position seemed to entitle him. From the provincial colleges of La Roche and Annecy, he was sent to Paris in 1578, where he entered the then brilliant school of the Jesuits, and completed under their care the course of rhetoric and philosophy. In 1584 he went to Padua, for the course of civil law, and pursued his studies there with great distinction till 1591. At this time his father, who had obtained for him a place in the senate, proposed to him a very brilliant and advantageous marriage, but he had already resolved to devote himself to the ministry, and with much difficulty obtained his father's consent to enter into orders in the diocese of Geneva. He soon became distinguished as a preacher, and the zeal with which he discharged the ordinary duties of his ministry was no less remarkable. Very soon after his ordination he was employed by his bishop in a mission for the conversion of the Calvinistic population of Chablais, which had been recently annexed to the duchy of Savoy, and in which the duke was desirous of having the Catholic religion re-established. The success of this mission was almost unprecedented. With a companion equally devoted, he traveled on foot from town to town, and in a short time he succeeded in reclaiming many to the church. One of the most remarkable incidents of his mission was a conference with the celebrated Calvinist leader, Theodore de Beza. Of this interview very different accounts are given by the rival partisans; but all agree in admiration of the gentleness and enlightened liberality of Francis de Sales. At the termination of this mission, Francis was, in 1596, appointed coadjutor to the bishop of Geneva, Mgr. Granier, with the title of bishop of Nicopolis. It was with much difficulty that the pope, Innocent IX., induced him to accept this dignity. Some time afterward, having occasion to go to Paris, he was invited to preach the Lent in the chapel of the Louvre; and his lectures, which were partly controversial, were reputed to have had so much influence in bringing about the conversion of several of the Huguenot nobles, that the king tried to induce him to accept a French bishopric; but in vain. He returned to his diocese; and soon afterward, on the death of Mgr. Granier, he succeeded to the bishopric of Geneva. His administration of this charge, upon which he entered in Dec., 1602, was beyond all praise. Being again invited to preach the Lent at Dijon, in furtherance of the plans of Louis XIV. for the conversion of the Huguenots, he was again pressed by that monarch to accept a French bishopric. But he again declined this honor, as he also declined in 1607 the offer of the cardinalate from the pope, Leo XI. It was about this time that he published his well-known *Introduction to a Devout Life*, which has continued to the present day one of the most popular manuals of piety and the ascetic life. Among his measures for the renovation of the monastic spirit, a very important one was the establishment of a congregation of nuns of the order of the Visitation, under the direction of the now celebrated Mme. de Chantal, with whom he long maintained a correspondence on every subject connected with the spiritual and religious life, which was published in 1660, and which still remains a subject of almost undiminished interest for the spiritualist. In 1608 his infirmities compelled him to solicit the assistance of a coadjutor in the charge of his diocese. He continued, however, to labor to the last. His last sermon was delivered at Lyons, on Christmas eve in 1622; on Christmas-day he was seized with paralysis, and on the 28th of the same month he expired. He was buried in the church of the Visitation in that city, but his remains were afterward translated to Annecy. More than 40 years after his death, in 1665, he was solemnly canonized as a saint by Alexander VII. His festival is held on Jan. 29, the day of the translation of his relics to Annecy. His works were published in a collected form in 2 vols. folio at

Paris in 1641; but the separate works (especially the *Devout Life*, which has been translated into almost every European language), have passed through innumerable editions and still retain their popularity.

SALEYER ISLANDS, THE, lie in the Indian ocean, to the s. of Celebes. Upward of thirty of the group are small, hilly, densely wooded, and, with few exceptions, uninhabited. Great Saleyer, in $5^{\circ} 44' - 6^{\circ} 28'$ s. lat., and $120^{\circ} 23' - 120^{\circ} 37'$ e. long., is upward of 47 m. in length, and 7 in breadth, the area being 245 sq. miles. The mountains on the e. coast rise abruptly out of the sea, and along the w. is a slip of level land planted with cocoa-nut trees. Great Saleyer and the smaller islands produce fine timber, including ebony and teak. Indigo, coffee, and mustard are grown; but millet, maize, earth-fruits, and cotton are the staple cultures, the grounds being carefully fenced. Agriculture is the chief employment, and fishing, making salt, etc., are also carried on. The exports are cocoa-nuts, cocoa-nut oil, cotton, and cotton fabrics. Imports—rice, gambier, tobacco, yarns, iron and copper wares. The sea is rich in various kinds of fish—a long and thin species, the saleyer, giving a name to the island. The chief products of the principal island, Great Saleyer, are rice, potatoes, tobacco, indigo, cotton, salt, and live stock, especially horses and cattle. Regular steamship connection exists between the island and Celebes. Its capital is Saleyer on the west coast with a good roadstead, a school for the natives, and a flourishing trade. The Saleyer group comprises some 72 islands, which form an administrative district of the Netherlands. Among them are Tambolangan, Bonerate, Tanah-Djampedja and Kalao. Bonerate has a population of about 24,000. Pop. of group about 57,000, of the Malay race, and for the most part of the Mohammedan religion.

SALFORD, a municipal and parliamentary borough, Lancashire, is considered as virtually a portion of the city of Manchester (q.v.). Pop. '91, 198,136.

SALIANS or **SALIC FRANKS**, a tribe of Germans who originally inhabited the country between the Meuse and the Rhine, but in the 5th c. invading and conquering Gaul under Clovis, they founded the French monarchy. They are called Salians, perhaps, from the river Saale in Saxony, on the banks of which they lived before they emigrated to Gaul. Their code of laws was called Salic law (q.v.).

SALICINE, $C_{13}H_{18}O_7$, is a member of the group of organic compounds to which the term *glycosides* has been recently applied by chemists—a group which is specially characterized by the fact that each of its members, when exposed to certain chemical agencies, breaks up (usually after the absorption of water) into glucose (or grape-sugar) and other compounds. Salicine is a glucoside of salicylic alcohol (saligenin), and its formula may be written thus: $C_6H_4(CH_2OH) \cdot O \cdot C_6H_{11}O_6$. It occurs in the bark of the various species of willow and poplar, in the blossoms of several species of *spiræa*, and probably in the animal secretion known as *castoreum*. It may be obtained in small, colorless, glistening prisms of an intensely bitter taste, which are readily soluble in hot water and in alcohol, and moderately soluble in cold water, and are insoluble in ether and oil of turpentine; and its solutions exert a left-handed rotatory action upon a ray of polarized light. It is readily split into its constituents, salicylic alcohol and glucose, by certain reagents, and Michael has shown that it is possible to prepare it synthetically. When heated to 392° F. (200° C.), salicine fuses; and at a higher temperature it is entirely decomposed. It dissolves in strong sulphuric acid, the solution being of a purple or blood color. Salicine is manufactured to a considerable extent as a cheap substitute for quinine, and the latter is sometimes adulterated with it. There are various modes of extracting it from the macerated bark; and 1 pound of the bark of *salix pentandra* yields, according to Erdmann, 5 drams of salicine. If it is not so certain in its action as a febrifuge as quinia, there can be no doubt that it is an excellent tonic; and it possesses this advantage over the latter substance, that it is less liable to irritate the stomach. As a tonic, two grains may be given three or four times a day; as a febrifuge, from one to two scruples in divided doses, during the intermission. It may be prescribed as a powder mixed with sugar, or dissolved in water, with the addition of some agreeable syrup.

SALIC LAW. The code known as the *salic law* is a collection of the popular laws of the Salic or Salian Franks (see FRANKS) committed to writing in barbarous Latin in the 5th c., while the people were yet heathens. There exist several texts of this code, and considerable obscurity rests over its history. It relates principally to the compensation and punishment of crimes, and there is a chapter containing provisions regarding the succession to what are called *salic lands*, which seems to have been inserted at a later date. It is difficult to determine precisely what these lands were. The *terra salica* was probably so called from its being more especially attached to the *sal* or hall of the lord or proprietor (some derive *salic* as applied to the people from the same word); it thus came to designate inherited land as opposed to property acquired otherwise. Although the Frankish law did not in general exclude females, the succession to these Salic lands, whatever they were, was confined to males, probably from the importance of securing the military service of the chief proprietors. It was but a doubtful analogy that led the rule of succession to Salic lands to be extended to the succession to the French crown, and it seems to have been only in the 14th c. that the exclusion of females from

the throne became an established principle. The accession of Philip the Long was probably the first occasion on which it received public sanction, and the fact that Edward III. rested his claim on female succession, doubtless led to that instance being regarded as an unquestionable precedent for all future time.—See Hallam's *Europe in the Middle Ages*, Guizot's *Essais sur l'Histoire de France*, and Hessel's *Lex Salica*.

SALICYLIC ACID AND SALICYLATES. Salicylic, or ortho-oxybenzoic acid, occurs in a free state in the flowers of meadow-sweet (*spirea ulmaria*) and as a methylic ether in oil of wintergreen (*gaultheria procumbens*), from which it may be obtained by distillation with potash. See GAULTHERIA and WINTERGREEN, Oil of. The resulting salicylate of potassium is then decomposed by hydrochloric acid. It may also be obtained from salicine and some other organic matters by adding them to hydrate of potassium heated to fusion. It is, however, more commonly prepared by heating sodium phenylate in a stream of carbonic acid gas. Sodium phenylate in solution is introduced into a retort, and the carbonic acid passed through it by means of a glass tube while heat is applied to the retort, gradually heating from 212° F. (100° C.) to 356° F. (180° C.), and not higher than 392° F. (200° C.). Carbonic acid enters into the molecule of phenol, producing salicylate of sodium, while one half of the phenol distills over. The following equation represents the reaction: $2C_6H_5ONa + CO_2 = C_6H_4(ONa)(CO_2Na) + C_6H_5OH$. The residue in the retort is then dissolved in boiling water, filtered, and decomposed by muriatic acid. On cooling, impure salicylic acid, having a reddish-brown color, is precipitated in the form of a crystalline powder. In the last operation the reaction is as follows: $C_6H_4(ONa)(CO_2Na) + 2HCl = 2NaCl + C_6H_4(OH)(CO_2H)$, which latter body is salicylic acid. Chloride of sodium (common salt) remains in solution. The impure acid is purified by dissolving it in boiling water or weak alcohol, treating the solution with animal charcoal, adding a little hydrochloric acid, and crystallizing the filtrate. Squibb purifies it by subliming with the aid of steam. By the above process the acid is obtained in small acicular crystals; white, inodorous, and of an acrid, acid-sweetish taste. It may be obtained from the alcoholic solution by spontaneous evaporation, in large, monoclinic prisms, and if the aqueous boiling solution is slowly and carefully cooled it may be crystallized in long, slender needles of the same crystalline formation. It requires about 1800 parts of cold water to dissolve it, and the aqueous solution imparts a deep, beautiful violet color to ferric salts. It melts at 311° F. (155° C.), and if carefully heated sublimes unaltered. By increasing the heat phenol (carbolic acid) is given off, and when still more highly heated with powdered glass and quick-lime it is decomposed into both phenol and carbonic acids (CO_2 and C_6H_5OH). It decomposes carbonates with effervescence, forming salicylates with the bases. Salicylate of sodium is prepared in two ways: by neutralizing the acid with caustic soda or by neutralizing with carbonate and bicarbonate of soda, evaporating to dryness in either case. By the first method the composition of the salt is $C_6H_4(ONa)(CO_2Na)$, but by the second method, $C_6H_4(OH)(CO_2Na)$; an atom of hydrogen replacing one of the sodium atoms. Salicylate of ammonium is prepared in a similar manner by neutralizing the acid with ammonia or carbonate of ammonia and evaporating, the acid salt crystallizing in needles. If the liquid is rendered alkaline by excess of ammonia, the neutral salt will be formed. These salts are readily soluble in water. Salicylic acid and the salicylates, particularly the two just described, have been recently used to a considerable extent in medicine. Plants watered with salicylic acid die soon because the acid prevents those organic changes necessary to assimilation. It will prevent the germination of seeds, acting in this respect like carbolic acid, by arresting the action of diastase on the germ. This is the peculiar action of most organic antiseptics, and is the cause of its beneficial action as a medicine in cases where it is applicable. Physiological action on animals: If a grain of salicylate of sodium is introduced under the skin of a frog the animal soon becomes languid and the heart paralyzed. When administered to animals in sufficient doses it produces paralysis of the spinal nerves. Rochefontaine concluded that the acid, 1, impairs the general reflex sensibility by its action on the brain and spinal cord; 2, muscular contractility is suspended; 3, respiratory movements are suspended; 4, the heart's action is arrested. More recent observers say that the primary action of salicylate of sodium increases the cardiac force and that paralysis is a secondary or reactionary effect. The results of various experiments are conflicting. According to Fürbringer the acid has no power in reducing the temperature in inflammatory fever, but has such power in septic fever. Zimmerman, however, found that septic fever resulting from injecting putrid fluids in the veins of rabbits was not controlled by the acid, a result which might have been expected. Such experiments have but little value to the medical practitioner. As regards the effects of salicylic acid and salicylates upon the human organism, very large doses cause severe headache, muscular weakness and tremor, tingling in the extremities, and raising the pulse to 140 beats per minute. The urine gives a violet color on the addition of perchloride of iron soon after administration, showing a rapid passage through the system. It undergoes some change, however, in passing through the kidneys, because the urine does not have the power of checking fermentation. The effects vary with circumstances and with different individuals. A patient having rheumatism took six drams of salicylate of sodium in the course of 22 hours, and suffered no pain in the stomach, but the appetite was improved. In one

case alarming symptoms, attended with delirium, followed the administration of one dram. Sometimes there is roaring in the ears, disorders of vision, maniacal fury and loss of power in the limbs. Gastric disturbance sometimes takes place resembling that of corrosive poisoning. Children are more apt to be affected in this way than adults. In one case of articular rheumatism a rapid cure was thought to be taking place, when buzzing in the ears, profuse sweats and extreme prostration came on, and the patient died suddenly. Abelin states that acute nephritis (inflammation of the kidney) may occur during the use of the drug. A case of urticaria is recorded as having taken place from its use. In acute inflammations there is much contradictory evidence in regard to the use of the medicine. One physician boasting of the antiphlogistic action of salicyline reported a mortality of 11 cases out of 35, an unfavorable result. In diphtheria some report favorable and others unfavorable, results. There is but little doubt, however, that when carefully administered in smaller doses than, unfortunately, are too often employed in modern practice, it may prove beneficial in some cases of septic disease, and in hay fever. It has been reported to have cured cases of diabetes, but this may be doubted; it may have suspended the elimination of sugar by the kidneys, but such an action does not necessarily constitute a cure of this disease, which is one essentially of assimilation and nutrition, depending usually on a profound affection of the nervous system, and not to be gotten rid of in any summary manner. As an external application it has been used with benefit in several skin diseases, but it is probable that in all the cases in which it has been used internally and externally, an equal or better effect could have been accomplished by minute doses and applications of carbolic acid. As to its administration, that is to be left entirely to the physician, whether given in the form of salicine (q.v.) salicylic acid or salicylates. It may be remarked here that when salicine is given it is converted in the organism into salicylic acid.

SALIENT, in heraldry, an attitude of a lion or other beast, differing but slightly from *rampant* (q.v.). He is supposed to be in the act of springing on his prey, and both paws are elevated. Two animals *counter-salient* are represented as leaping in opposite directions.

SALIENT, in fortification, is that which points outward from the interior of any work. For example, the central angle of a bastion, pointing toward the enemy, is a salient angle.

SALIEN'TIA, a name sometimes applied to the order *batrachia*, or *anoura*, embracing the frogs, tree-frogs, and toads. See *BATRACHIA*, *FROG*, *TREE-FROG*, and *TOAD*.

SAL'TÉRI, ANTONIO, 1750-1825; b. in the state of Venice; studied music in St. Mark's cathedral, and in 1766 at Vienna under Gassman. In 1770 he produced his first opera, *Le Donne Letterate*. He became famous as a composer of dramatic and church music. Of his operas, *Les Danaïdes* and *Tarare* are considered the best. He wrote in all 46 operas, 3 oratorios, 8 cantatas, 2 symphonies, and many miscellaneous compositions.

SALIFEROUS SYSTEM, the name given by the earlier English geologists to the new red sandstone (q.v.) formations, because the deposits of salt in England occur in these strata. As, however, this substance has been found associated with strata of all ages in different parts of the world, the name has been given up.

SAL'IFIABLE BASE, a term applied in chemistry to any substance capable of uniting with an acid to form a salt.

SAL'INA, or **SALINI**, one of the Lipari islands (q.v.).

SALINE, a co. in central Arkansas, crossed by the St. Louis, Iron Mountain, and Southern railroad, and drained by Saline river; 622 sq. m.; pop. '90, 11,311. The surface is undulating, and partly covered with forests of oak, hickory, and pine; the soil is fertile. The principal products are corn, tobacco, honey, butter, wool, and cotton. It contains large quarries of marble and soapstone, also slate and blue limestone. Co. seat, Benton.

SALINE, a co. in s. Illinois, drained by the middle and s. forks of the Saline river, on the Cleveland, Cincinnati, Chicago, and St. Louis, and the Louisville and Nashville railroads; about 380 sq. m.; pop. '90, 19,342, chiefly of American birth. The surface is rolling and heavily timbered. The soil is fertile. The principal productions are corn, wheat, tobacco, and live stock. Co. seat, Harrisburg.

SALINE, a co. in central Kansas; drained by the Smoky Hill and Saline rivers; traversed by the Atchison, Topeka, and Santa Fé and other railroads; 720 sq. m.; pop. '90, 17,442, chiefly of American birth. The surface is mostly fertile prairie; wheat, corn, oats, hay, potatoes, and butter are the staples. Co. seat, Salina.

SALINE, a co. in central Missouri, bounded n. and e. by the Missouri river, and drained by branches of La Mine river; 760 sq.m.; pop. '90, 33,762, chiefly of American birth, 4936 colored. The surface is mostly prairie land, and the soil rich. Coal, lead, and building stone are found. Tobacco, corn, sweet-potatoes, and sorghum are staples. Co. seat, Marshall.

SALINE, a co. in s.e. Nebraska, crossed by the Burlington and Missouri River railroad, and drained by the Big Blue, and the north fork of Turkey creek; 576 sq.m.;

pop. '90, 20,097. The surface is rolling; the soil is fertile. The principal productions are corn, hay, live stock, and potatoes. Co. seat, Wilber.

SALINE PLANTS are those which require for their healthy and vigorous growth a considerable supply of *chloride of sodium* (common salt) and other salts, and which are therefore limited to peculiar situations. Few of them are strictly aquatic plants, except the marine algæ, or sea-weeds, which grow immersed in salt water, either always or in certain states of the tide, and derive their nourishment from it through their fronds, and not by roots, from the rock to which they are attached. Grass-wrack (q.v.), however, is an instance of a phanerogamous plant living entirely and always immersed in salt-water. Other phanerogamous plants grow chiefly or only on the sea-shore and in salt marshes. Some of these, however, as the sea-kale, may be cultivated in gardens remote from the sea, but they succeed best when liberally supplied with salt. Asparagus is another well-known garden-plant, which derives much benefit from similar treatment. Some of the saltworks (q.v.) and other saline plants yield much soda when collected and burned.

SALINE POWDER, COMPOUND, is a very popular and harmless form of aperient medicine. The ordinary method of preparing it is by drying, at a gentle heat, and then pulverizing 4 oz. of pure chloride of sodium (common salt), 4 oz. of sulphate of magnesia (Epsom salts), and 3 oz. of sulphate of potash. These salts must then be mixed and triturated together, and kept in an air-tight vessel. Two or three drams dissolved in half a pint of water, and taken before breakfast, usually act efficiently. Dr. Neligan states that if 4 oz. of sulphate of soda be used instead of the sulphate of potash, and a sufficiently high temperature be employed to expel all the water of crystallization from the different ingredients, one dram of the resulting compound acts as energetically as two or three drams of the ordinary powder.

The following is a more agreeable form than the preceding, and equally efficacious. Take half an ounce of carbonate of magnesia, and an ounce of each of the following substances—viz., sulphate of magnesia, bicarbonate of soda, tartrate of soda and potash, and tartaric acid. Expel all the water of crystallization, and mix. This powder, if kept dry, effervesces when mixed with water, and one or two teaspoonfuls form the average dose. The addition of a drop of oil of lemon and a little powdered white sugar to each dose, makes this one of the most agreeable laxatives that can be prescribed.

SALINS (anc. *Salinæ*), a t. of the department of Jura, France, 21 m. s.s.w. from Besançon, on the Furieuse, a feeder of the Doubs. It is situated in a narrow rocky gorge between two lofty hills, looking upon a fertile and beautiful valley. It derives its importance from its salt-works, from which also it has its name. The salt is obtained from brine-springs, and the brine is first slowly evaporated in *maisons de graduation*, and afterward by boiling. There are iron-works, soda-factories, tanneries, and quarries of gypsum in Salins and its immediate neighborhood. Salins has been the scene of many sieges, and has been burned down a number of times, the last time in 1825. Pop. '91, commune, 6068.

SALISBURY, a town in Litchfield co., Conn.; on the Housatonic river and the Phil., Read, and New England railroad, 63 miles n.w. of Hartford. It is in the midst of a fertile region, noted for its picturesque scenery. The surface is mountainous, and, in the vicinity are five beautiful lakes. Iron ore abounds. It has ore mines, blast-furnaces, iron foundries, woolen mills, and manufactories of car wheels, cutlery, cutlery handles, and bicycle supplies. It is the seat of the state school for imbeciles; has the Scoville memorial library, Hotchkiss and Lord schools, and St. Mary's convent; comprises the villages of Salisbury, Chapinville, Lakeville, Lime Rock, and Ore Hill; and is an attractive summer resort. Pop. '90, 3420.

SALISBURY, a town in Essex co., Mass.; on the Merrimac river and the Boston and Maine railroad; 2 miles n. of Newburyport. It was incorporated in 1640; contains the villages of Salisbury and Salisbury Beach; and has electric street railroads connecting with Haverhill, Merrimac, and Amesbury, electric lights, public library, high, grammar, intermediate, and primary schools, and an iron bridge 1000 feet long connecting it with Newburyport. Salisbury Beach is a popular watering-place, with excellent bathing. Pop. '90, 1316.

SALISBURY, or **NEW SARUM**, the capital of Wiltshire, is an episcopal city, and a municipal and parliamentary borough, and stands in a fertile valley on the Avon, at the junction of that river with two of its affluents, 81 m. w.s.w. of London by the South-Western railway, and 23 m. n.w. of Southampton by a branch of the same. Its several parts are connected by 3 bridges. The town dates from 1220, in which year the cathedral was founded, and the inhabitants of Old Sarum (see **SARUM, OLD**), 2 m. to the n., removed to Salisbury, attracted to the new site by the abundant supply of water. At the foundation of the town, the ground was divided into squares or "chequers" as they are called, to which the town is indebted for its appearance of airiness and regularity. The cathedral, the principal building of Salisbury, is one of the finest specimens of early English in the country. It was begun in 1220, and was finished in 1258. The spire, which was added after the building was completed, is the "most elegant in proportions and the loftiest in England." Its height from the pavement is 406 ft., only 56 ft. less than that in Strasburg. The cathedral is 473 ft. long; height in the interior, 81 ft.; width of great tran-

sept, 203 feet. It is in the form of a double cross, is perfect in its plan and proportions, and in the main uniform in style. The w. front is still rich, beautiful, and graceful, though now denuded of statues, upward of 100 in number, with which it was once enriched. The cathedral has been recently restored. The manufactures of cutlery and cloth, for which it was once famous, have long declined, and its trade is now chiefly in retail. Pop. '91, 15,980. It returns one member to parliament.

SALISBURY, EDWARD ELBRIDGE, b. 1814, a distinguished oriental scholar and linguist, professor of Sanskrit at Yale college for 13 years, from 1841, and of Arabic for nearly 20 years. Prof. Salisbury has for many years been editor of and contributor to the *Journal of the American oriental society*, of which he was one of the founders. The present Sanskrit professorship of the college was endowed by him.

SALISBURY, ROBERT ARTHUR TALBOT GASCOYNE CECIL, Marquis of; b. England, 1830; educated at Eton and Oxford. He was a conservative member of parliament, 1853-68, when he succeeded to the title. During this time he contributed much to periodicals. He was secretary of state for India in lord Derby's third administration in 1866, but resigned the next year, differing with him as to the reform bill. He was again secretary of state for India in the Disraeli cabinet of 1874. Two years later he was sent as special ambassador to Turkey, and with sir Henry Elliot represented Great Britain at the conference of Constantinople, in whose proceedings he took a leading part. In 1878 he succeeded lord Derby as secretary of state for foreign affairs, and soon afterward, with the earl of Beaconsfield, represented Great Britain at the conference of Berlin. He went out of office with the Beaconsfield administration in 1880, and became the leader of the opposition in the House of Lords to the Gladstone government. Upon the downfall of the latter, 1885, he was appointed premier by the queen; and again in 1886. He resigned in 1892, and was reappointed in 1895; suggested the plan for the negotiation of peace between Greece and Turkey on the basis of an international commission representing the great powers to control Greek revenues and the payment of old bonds and the indemnity to Turkey, 1897.

SALISBURY PLAIN, an extensive tract of undulating chalk country, in Wiltshire, between Salisbury and Devizes, about 20 m. long from n. to s., and about 14 m. broad. Its rolling surface resembles that of the ocean heaving after a storm. On this plain, about 8 m. n. of Salisbury, is Stonehenge (q. v.). Until within recent years, the expanse of Salisbury plain remained in a state of nature, and was covered with a fine turf, which afforded pasture to sheep.

SALISH, or SELISH, an Indian family of the Columbian group, dwelling in Idaho, Montana, and Washington; between the Sahaptins and the Shushwaps. They comprise the Flatheads in Montana; the Spokanes on the river of that name; the Skitsuish on lake Skitsuish; the Pisquorises on the Columbia; the Kalispels, of whom there are three groups, and the Colvillis, about Kettle Falls, on the Columbia. Many of these tribes are Roman Catholics. Their language and customs are not much different from a number of tribes of the Shushwap family.

SÂLIVÂHANA is the name of a Hindu prince who is said to have reigned in Magadha or South Behar. He instituted an era which bears his name, and the beginning of which took place when 3,179 years of the Kali-yuga, or the present mundane age, had expired; that is, 78 years after the beginning of the Christian era. This era is called Sâlivâhana Sâka, or simply Sâka. Thus 1865 of the Christian era would be tantamount to Sâka (i. e., in the Sâka era), 1787. The Sâka year is the same as, and begins with, the common solar year.

SALIVARY GLANDS. Under this name we designate three pairs of glands—the parotid, the submaxillary, and the sublingual, each gland having an efferent duct, which conveys the glandular secretions into the mouth, where, when mixed with the mucus secreted by the follicles of the mucous membrane lining the mouth, they constitute the ordinary or mixed saliva.

The *parotid gland*, so called from the Greek words *para*, near, and *ous*, the ear, is the largest of the three glands occurring on either side. It lies upon the side of the face immediately in front of the external ear, and weighs from half an ounce to an ounce. Its duct is about two inches and a half in length, and opens into the mouth by a small orifice opposite the second molar tooth of the upper jaw. The walls of the duct are dense and somewhat thick, and the caliber is about that of a crow-quill.

The *submaxillary gland* is situated, as its name implies, below the jawbone, and is placed at nearly equal distances from the parotid and sublingual glands. Its duct is about two inches in length, and opens by a narrow orifice on the top of a papilla, at the side of the *frænum* of the tongue.

The *sublingual gland* is situated, as its name implies, under the tongue, each gland lying on either side of the *frænum* of the tongue. It has a number of excretory ducts, which open separately into the mouth.

The minute structure of the parotid gland is described in the article GLANDS, and the other salivary glands are similarly constituted. True salivary glands exist in all mammals, except the cetacea, in birds, and reptiles (including amphibians), but not in fishes; and glands discharging a similar function occur in insects, many mollusks, etc. The

chemical and physical characters of the saliva are sufficiently described in the article DIGESTION.

The most common disease of the parotid gland is a specific inflammation, which has been already described in the article MUMPS. The term *parotid tumors* is given to tumors of various kinds occurring in front of the ear and over the parotid gland. With regard to surgical interference, Liston recommends that "if there be reason to suspect that the disease is of a malignant nature, and not thoroughly limited by a cellular cyst, no interference is admissible; if, on the contrary, it be at all movable, has advanced slowly, possesses a smooth surface, and is firm, then an operation may be contemplated."

Certain functional disorders of the salivary glands require notice, of which the most important is that known as *salivation* (q.v.), or *ptyalism*, which consists in a much increased secretion of saliva. *Deficient secretion* is indicated by clamminess or dryness of the mouth, and is common in low forms of fever. It is important as indicating the condition of the system, and seldom requires treatment. If it should occur as an original affection, it must be treated by local sialogogues (q.v.), such as liquorice, horse-radish, pellitory, etc. *Alteration of the saliva* is not unfrequent in disease. For example, it sometimes loses its alkaline character, and becomes acid, as in acute rheumatism, diabetes, etc.; whilst in other cases, it becomes so fetid as to be a source of annoyance both to the patient and his friends, as, for example, in scurvy, various forms of dyspepsia, salivation, etc. The undue acidity may be corrected by the administration of carbonate or bicarbonate of soda, while the fetor may be relieved by attention to diet, and by the use, both local and general, of creosote, nitro-muriatic acid, charcoal, chlorate of potash, etc.

Ordinary inflammation of these glands (distinct from mumps) may proceed from cold or local injury, but it is often produced by decayed teeth.

SALIVATION, or **PTYALISM**, (from the Gr. *ptyalon*, the saliva), is the term employed to designate an abnormally abundant flow of saliva. It most commonly arises from a specific form of inflammation of the parotid glands, induced by the action of mercury, in which case it is termed mercurial salivation; but it occasionally arises from the action of other drugs, especially iodide of potassium; and sometimes it occurs without any apparent cause, in which case it is said to be *idiopathic*, or spontaneous.

Mercury, in some form or other, is so common an ingredient in the quack medicines whose advertisements are unfortunately allowed to occupy a large space in many of our newspapers (especially in those medicines which are falsely stated to be of purely *vegetable origin*), that a popular knowledge of the most remarkable manifestations of this powerful mineral should be as widely diffused as possible. When this medicine is given in such a way as to excite salivation, a metallic taste in the mouth is soon recognized by the patient, and a remarkable but indescribable smell, known as the mercurial fetor, may be detected in his breath; the gums become swollen and spongy at their edges, and usually present a few slight ulcers; and an increased flow of saliva takes place, accompanied by pain in the teeth on pressure. If these symptoms be not checked (and *a fortiori* if more mercury be given), the tongue, cheeks, and throat swell and ulcerate, and the saliva that flows away amounts to several pints in the course of the day. This peculiar action of mercury varies extremely in different persons. Dr. Watson, in his 14th lecture, records several remarkable cases in which a single small dose of mercury produced the severest salivation. Cases of the opposite kind, in which no impression on the gums or salivary glands can be made by the freest use of mercury, are by no means uncommon. It is worthy of notice that salivation is rarely produced in children below the age of ten years. Until a comparatively recent period, profuse salivation was deemed the only certain indication that the system was duly under the influence of mercury (and, indeed, it was believed that the cause of the disease was carried out of the body with the saliva); but now it is well known that all that is requisite is, that the gums should become distinctly tender, and that the mercurial fetor should be unmistakably present, and that those symptoms should be kept up for a certain time. Unfortunately, however, the physician cannot always stop the action of the mercury at that definite stage, and salivation to a distressing extent often occurs, even when the greatest care has been taken in the administration of the medicine. To check this excessive salivation, the internal administration of chlorate of potash in scruple doses, three times a day, together with the frequent use of a gargle of the same salt, has been recommended by several high authorities. Dr. Watson strongly advocates the use of a gargle composed of one part of brandy to four or five of water, and the application of moistened tannin to the gums; and when there is much external swelling, he applies eight or ten leeches beneath the edges of the jaw-bones; followed by the application of a soft hot poultice to the neck.

It is worthy of notice that, in the confluent form of small-pox, there is almost always more or less abundant salivation, which lasts for several days; and if it cease abruptly, the peril is usually great. Moreover, there is a more or less marked tendency to salivation in scurvy, hysteria, hydrophobia, some forms of mania, and not unfrequently in pregnancy.

Various cases of spontaneous salivation have been collected by Dr. Watson in his 44th lecture. In one instance of a girl ten years old, under his own care, no less than three pints of saliva were excreted in twelve hours. Medicine had no effect; but the

salivation finally ceased spontaneously after a severe attack of influenza. In these cases, astrigent washes, as a solution of alum, or the infusion of catechu or a few drops of creosote suspended by mucilage in water, are deserving of trial.

SALIX. See WILLOW.

SALLE, JEAN BAPTISTE DE LA. See LA SALLE.

SAL LEE, or SLA, a seaport t. of Morocco, in the territory and former kingdom of Fez, 108 m. w. from Fez. It stands on a low sandy point of the shore of the Atlantic, at the mouth of the Bu-regreb, on the northern side of the river, while opposite to it, on the southern side, is the town of Rabat. Both Sallee and Rabat were bombarded and nearly destroyed by the French in 1851. Sallee was in former centuries noted as a haunt of pirates, and a *Sallee rover* was the dread of peaceful mariners in the Atlantic and Mediterranean. It is particularly noted for the carpets which it produces, of fine texture and bright colors. They are mostly used in Morocco itself. The chief export from Sallee is wool. Pop. estimated at about 10,000.

SALLET, FRIEDRICH VON, 1812-43; b. Germany; entered the Prussian army in 1829. In 1830 he was condemned to imprisonment for 10 years, in punishment for a novel reflecting on the military service; but he was released after two months. He retired from the army in 1838. Among his works are *Gedichte*, 1835; *Schön Irla*, 1838; and *Laienevangelium*, 1842.

SALLOW, the popular name of a number of species of willow (q.v.) trees or low shrubs with downy branches, and generally ovate or obovate, wrinkled leaves, having stipules. The GRAY SALLOW (*salix cinerea*) is one of the most common British species, growing in moist and swampy places. Other common species are the ROUND-EARED SALLOW (*sallow aurita*) and the GREAT ROUND-LEAVED SALLOW (*sallow caprea*), the latter remarkable for preferring a dry soil, and becoming a small tree, the wood of which is used for the handles of agricultural implements. The LONG-LEAVED SALLOW (*sallow acuminata*) differs from the other kinds in its lanceolate leaves. It is frequent in Britain. None of the sallows produce such long and slender twigs as the osiers, nor are they adapted for any but the coarsest wickerwork, and some of them are so apt to break that they cannot easily be used in that way. But shoots of two years' growth are split up, and used for making hoops of barrels.

SALLOW-THORN, *Hippophaë*, a genus of plants of the natural order *eleagnaceæ*, consisting of large shrubs or trees with gray silky foliage, and entire leaves. They have diœcious flowers: the perianth is tubular, becomes succulent, incloses an enachenium, and forms an acid fruit. Few species are known: one only is European, *H. rhamnoides*, sometimes called the SEA BUCK-THORN, a large shrub or low tree, a native of the sandy sea-coasts of England and the continent of Europe. It is found also throughout great part of Tartary. It is sometimes planted to form hedges near the sea, growing luxuriantly where few shrubs will succeed. The berries are orange-colored. They are gratefully acid. They are used for making a sauce in the s. of France; a rob or jam is made of them on the shores of the gulf of Bothnia, to impart flavor to fresh fish; and a preserve or jelly made from them is a favorite luxury of the Tartars. The *stellate* hairs of the under side of the leaf, covering it like scales, are a beautiful microscopic object.

SALLUST, CAIUS CRISPUS, a Roman historian, was b. 86 B.C., at Amiternum, in the Sabine country. Though of a plebeian family, he rose to official distinction, first as quæstor about 59, and afterward as tribune of the people in 52, when he joined the popular party against Milo, who in that year had killed Clodius. His reputation for morality was never high; and his illicit connection with Milo's wife is assigned as the cause of his being expelled in 50 from the senate, although his attachment to Cæsar's party is a more plausible reason of his expulsion. In the civil war he joined the camp of Cæsar; and in 47, when Cæsar's fortune was in the ascendant, he was made prætor-elect, and was consequently restored to his former rank. When in Campania, at the head of some of Cæsar's troops, who were about to be thence transhipped to Africa, he nearly lost his life in a mutiny. In 46, however, we find him engaged in Cæsar's African campaign, at the close of which he was left as governor of Numidia. His administration was sullied by various acts of oppression, particularly by his enriching himself at the expense of the people. He was, for these offenses, accused before Cæsar, but seems to have escaped being brought to trial. His immense fortune, so accumulated, enabled him to lay out those magnificent grounds, still known as the gardens of Sallust, on the Quirinal, to retire from the prevailing civil commotion into private life, and to devote his remaining years to those historical works on which his reputation rests. He died 34 B.C., four years before the battle of Actium. His histories, which seem to have been begun only after his return from Numidia, are: 1st, *The Catilina* or *Bellum Catilinæ*, descriptive of Catiline's conspiracy in 63, during the consulship of Cicero; 2d, *The Jugurtha*, or *Bellum Jugurthinum*, commemorating the five years' war between the Romans and Jugurtha, the king of Numidia. These, the only genuine works of Sallust which have reached us entire, are of great but unequal merit. The quasi-philosophical reflections which are prefixed to them are of no value, but the histories themselves are powerful and animated, and contain effective speeches of his own composition, which he puts into the mouths of his chief characters. With its literary excellence, however, the

value of the *Jugurtha* stops, as in military, geographical, and even chronological details, it is very inexact. Of his lost work, *Historiarum Libri Quinque*, only fragments exist, some of which were found as late as 1886. The *Dux Epistolæ de Republica Ordinanda* and the *Declamatio in Ciceronem* are of doubtful authenticity. Apart from his literary qualities, which are rather those of an artificial than a natural writer, and which are not enhanced by his affectation of brevity, and his love of archaic expressions, Sallust has the merit of having been the first Roman who wrote what we now understand by "history." In official public life, he was more of a politician than a statesman, and the views which he supported were liberal, not so much because he loved the people, as because he hated the nobility. The best editions of his literary remains are those of Corte (Leip. 1724), Gerlach (Basel, 1823-31), Kritz (1828-34), Fabri (1831), Dietsch (1842), and the critical edition of 1859. See also B. Maurenbrecher, *Sallusti Historiarum Reliquiæ* (1891-3).

SALLY-PORT, a gate or passage by which the garrison of a fortress may make a sally (through Fr. from Lat. *salio*, I leap or spring) or sudden attack on the besiegers. The name is applied to the postern leading from under the rampart into the ditch; but its more modern application is to a cutting through the glacis, by which a sally may be made from the covert way. When not in use, sally-ports are closed by massive gates of timber and iron.

SALMAGUNDI (French, *salmigondis*, preserved pickles). A dish prepared from chopped meat and pickled herring, mixed with onions, oil, vinegar, and pepper, named after the Countess *Salmagondi*, lady of honor to Maria de Medici, who invented it. It also signifies a mixture or medley of other ingredients: a pot-pourri, as in musical compositions; a miscellaneous collection of literary works, as *The Salmagundi Papers*, a series of humorous articles commenced in 1807 by Washington Irving (q.v.) and James K. Paulding (q.v.). The Salmagundi Club of New York is composed of many of the best-known artists of the United States.

SALMASIUS, CLAUDIUS, the Latinized name of a celebrated French scholar, CLAUDE DE SAUMAISE, who was b. at Semar, April 15, 1588. His father, Benigne de Saumaise, a man of superior erudition, was his first teacher. At the age of ten, young Salmasius translated Pindar, and composed Greek and Latin verses. He studied philosophy at Paris, under the superintendence of Casaubon. From Paris he proceeded to Heidelberg, where he devoted himself to the science of jurisprudence, and publicly professed Protestantism, to which form of the Christian religion he had been secretly attached for many years. So insatiable at this time was his thirst for knowledge—book-knowledge, at least—that he was wont to devote two whole nights out of three to hard reading, in consequence of which he brought himself to within an inch of the grave. In 1608 he published from MSS. two treatises of the sectary, Nilus, archbishop of Thessalonica, and a work of the monk Barlaam on the primacy of the pope. In 1620 appeared his edition of the *Scriptores Historiæ Augustæ*, and in 1629 his chief work, *Plinianæ Exercitationes*, after the publication of which he set himself vigorously, and without the help of a master, to acquire a knowledge of Hebrew, Arabic, Coptic, and other oriental tongues. In 1631 he was called to Leyden, to occupy the chair that Joseph Scaliger had held there, and it is from this period that his European reputation as a scholar and critic dates. Various efforts were made (1635-40) to induce Salmasius to return to France, but he declined them on the ground that his spirit was too "liberal" for his native land. Queen Christina of Sweden, however, managed to bring him to Stockholm, and fix him there for a year (1650-51), after which he returned to Holland. He died of a fever caught by imprudently drinking the waters at Spa, Sept. 6, 1653. Salmasius was certainly a great scholar of the old-fashioned clumsy sort; but neither his wit nor his acumen was sufficiently keen to give an intellectual and critical value to his lucubrations; and though all his distinguished contemporaries, Casaubon, Gronovius, Grotius, Vossius, etc., deluged him with praise; though Balzac pronounced him *infallible*; though the curators of the university of Leyden declared that "their university could no more do without Salmasius than the world without the sun;" though queen Christina went the length of saying, with truly royal flattery, "that she could not live without him,"—he is remembered, not for his inexhaustible stores of erudition, his editions of the classics, or his treatises on classical antiquities, but for his controversy with John Milton, scarcely his inferior in scholarship, and infinitely his superior in power of brain, and in all the arts of literary warfare. The question at issue was the lawfulness of the execution of Charles I. Apart altogether from the merits of the case, the great poet utterly overwhelmed his adversary, partly by the magnificence of his language and sentiments, and partly by the unscrupulous fury of his invective. Salmasius also is grossly abusive and acrimonious in his treatise (*Defensio Regiæ pro Carolo I.*, 1649): *asinus* (ass), *pecus* (beast), and such-like expressions being showered about quite freely; but he is deficient in logic, in real force of sarcasm, and in intellectual vigor generally.

SALMON (*salmo*), the typical genus in the family of *salmonidæ* (q.v.). The name *salmon* is chiefly applied to the large marine and anadromous species of the group. Of these, two species, found in the North Atlantic, belong to the genus *salmo*, while the five species of "king salmon," found in the North Pacific, constitute the genus *oncorhynchus*. The genus *salmo* is now restricted to include those *salmonidæ* which have the mouth large, with strong teeth in the jaws, palatines and tongue, and the vomer

flat, with teeth both on its head and its shaft, although in the old salmon the teeth on the shaft are usually lost with age, the scales moderate or small and not imbedded in the skin, and the dorsal and anal fins short, of about 11 rays each. All the species of *salmo* are spotted with black, and in most of them the sexual differences are strongly marked, the male fish having stronger jaws and stronger teeth than the female. These peculiarities sometimes become greatly intensified in the breeding season.

ONCORHYNCHUS.—The genus *oncorhynchus* closely resembles *salmo*, from which it is distinguished chiefly by the greater number (14 to 20) of its anal rays. The gill rakers, branchiostegals, and pyloric cæca are also more numerous than in *salmo*.

SALMO.—The genus *salmo* is divisible into two subgenera, *salmo* and *fario*. *Salmo* proper comprises but one species, the true salmon (*salmo salar*). In this group, the teeth on the shaft of the vomer are few and mostly lost with age. The species is large in size and spends a large part of its life in the sea, ascending the rivers to spawn. It is found only in the North Atlantic, the salmon of the Pacific belonging to the genus *oncorhynchus*.

The subgenus *fario* is characterized by the presence and persistence of numerous teeth on the shaft of the vomer, arranged in two rows, or in one zigzag row. The species reach, in general, a smaller size than the salmon, and they are more nearly limited to the fresh waters. Some of them, "salmon trout" and "steel-head salmon," are more or less anadromous, and reach a size not much less than the genuine salmon. The species of *fario* are known to English-speaking people as trout (q.v.). Trout are abundant in the streams and lakes of Europe, Northern Asia, and Northwestern America. The true (or black-spotted) trout are not found in America to the Eastward of the Rocky Mountains, their place in this region as well as their name of Trout being taken by the red-spotted Charrs (q.v.) of the genus *salvelinus*.

THE SALMON (*salmo salar*).—The longest known and, on that account, at least, the most important of the family is the Atlantic Salmon, *salmo salar*. "In the country of Aquitania, in France," says Pliny, "the river salmon passeth all other sea-fishes whatsoever." "This was the salmon's christening," says Professor Goode, "and though nearly one hundred species of the family *salmonidae* are now known to naturalists, one has always stood pre-eminent, like a Scottish chieftain, needing no other name than that of his clan. The luxurious Romans prized highly the salmon streams in their Gallic and British provinces, if we may trust Pliny and Ausonius, and that this fish was well known to the early English is evinced by the many Saxon names, such as 'Parr,' 'Peal,' 'Smolt,' 'Grilse,' 'Kipper,' and 'Baggit,' given it in different stages of growth. The Normans brought over the name of Latin origin, which they applied to the perfectly adult fish ready for the banquets of the Conqueror."

DISTRIBUTION OF SALMON.—The salmon is found on both sides of the North Atlantic, from about latitude 42° to the Arctic Circle, or beyond. In America its southernmost limit is the Delaware River, and it has never been abundant south of the mouth of the Connecticut. In Europe the southernmost limit is the northern coast of Spain. In the centre of its range, the salmon, both in Europe and America, has been excessively abundant. In both continents the advance of civilization, with its accompaniments of obstructions, pollution, and over-fishing, has greatly reduced the number of fishes by the destruction of individuals, and by preventing their reproduction. In 1798, according to Dr. Goode, a dam was placed in the Connecticut at Miller's River. The stream was formerly so full of salmon that it was said, in 1783, that "no finite being can number them." "For two or three years fish were observed in great abundance below the dam, and for perhaps two years they continued to appear, vainly striving to reach their spawning grounds; but soon the work of extermination was complete. When, in 1872, a solitary salmon made its appearance, the Saybrook fishermen did not know what it was."

The salmon is apparently derived from a fresh water stock, and in many cases it is "land-locked," and never descends to the sea. The land-locked salmon, either in Europe or in America, is not a distinct species, but a series of individuals more or less affected by their surroundings and by the limitation of their range.

BREEDING OF THE SALMON.—About one-half of the life of the salmon is spent in the sea. Its eggs are deposited in the fall or the winter, and only in water of low or falling temperature (about 50° F.). At the approach of the spawning season the male salmon undergo important changes in appearance. The symmetry of form is lost through the development of a fleshy hump at the shoulders and a large cartilaginous hook called the "Kip," at the end of the lower jaw. Meanwhile, the upper jaw becomes also prolonged and arched, and the front teeth increase in size, till they resemble the canine teeth of a dog. The scales sink into the spongy skin, and the color is no longer silvery, but variously blotched with black or red. In this condition, either before or after spawning, these male fish are known in England as "Kelts." The kelts are unfit for food. They are hungry and quarrelsome, and in their return to the sea often very destructive to other fish. They are, therefore, in England, a great annoyance to the anglers who desire to take nothing but "clean fish," and must return the kelts to the sea. The eggs, which are about $\frac{1}{4}$ of an inch in diameter, are deposited in deep furrows in the sand or gravel on the bottom. They are always in cold water, and usually in or near a ripple or rapid. The eggs number from 5000 to 15,000 or more.

according to the size of the fish. It is said that an estimate of 1000 eggs for each pound in weight of the female fish is not far from correct. From three to twelve days is occupied in the process of spawning. The eggs begin to show signs of life in from 30 to 60 days or more, according to the temperature of the water. The eyes then appear as small specks. In from four to six months the young fish appears, but this time may be greatly shortened in the warmer waters of an artificial hatchery. The eggs are readily hatched in an aquarium, if proper care is taken to prevent the stagnation of the water. A temperature as high as 70° F. is fatal to the eggs.

The young fish lies coiled up in the egg, which it finally bursts in its struggles to be free, and it issues with the yolk sac suspended under its belly. This affords it nourishment during the first five or six weeks. The mouth is at first very imperfectly developed, and the whole body has a form very different from that of the mature salmon. The slightest injury is fatal. The length is at first about $\frac{1}{4}$ of an inch. In some seven or eight weeks it becomes a shapely little fish about an inch in length and marked, as are all the young of the salmonidæ, with 9 or 10 distinct dusky cross-bars. These marks remain until it reaches a length of 6 to 8 inches. While these bands remain, the young salmon is known in England as a "Parr." For a long time the "parr" was considered as a distinct species of fish, and appeared in the books under the name of *salmo salmulus*. The fact that the Parr is a young salmon was first shown by Mr. Shaw, of Drumlaurig, in 1834. When the Parr descends to the sea, usually in late spring, its markings are lost, and it becomes of a bright silvery hue. This hue is assumed by all salmon and trout when they enter the salt water. In this stage the young salmon is known as the "smolt." In the sea they feed freely on crustaceans and small fishes, increasing rapidly in weight. On their first run up the river, as the sexual organs begin to develop, the fish becomes a "grilse," and finally, after reaching full maturity of form and size, it is recognized as a salmon.

The growth of the salmon in fresh waters is slow. In the sea it is extremely rapid. "He is ever bred in the fresh rivers," says Isaac Walton, "and never grows big but in the sea." A kelt was caught by the late duke of Athole which, on March 31st, weighed ten pounds. It was marked and returned to the Tay, in the lower part of which it was again caught after five weeks and two days, when it was found to weigh 20 $\frac{1}{2}$ pounds.

The usual weight of mature salmon is from 15 to 20 pounds, but they occasionally become much larger. The largest on record was brought to London in 1821, and weighed 83 pounds.

MIGRATIONS OF SALMON.—Salmon ascend rivers to a great distance from the sea, as the Rhine to the falls at Schaffhausen, the Elbe to Bohemia, the St. Lawrence to Niagara Falls. The speed of their most rapid movements is very great. It is said to be not less than 1500 feet a minute, but such speed is only sustained for a few moments, and their ordinary rate of progress up the rivers is from 10 to 25 miles a day. The perpendicular height which the salmon can leap over where there is an abundance of water is some 12 or 15 feet. They attempt higher leaps, but they often fall back exhausted. Goode quotes from Dr. A. Landmark, a Norwegian writer, "that when a salmon jumps a fall nearly perpendicular, it is sometimes able to remain in the fall even if the jump be a foot or two short of its actual height. The fish may be seen tumbling for a minute or two below the edge of the fall; then with a smart switch of its tail the fall is cleared. Only fish which strike straight with the snout are able to remain in the falling mass of water; if they strike obliquely they are carried back into the stream below." Salmon are able to rush up steep and broken cataracts to a much greater height. Of this fact advantage is taken in the provision of fish stairs for them by the side of the vertical fall of a dam.

VALUE OF SALMON FISHERIES.—The salmon fisheries of Great Britain, as well as those of America, have greatly declined in productiveness since the beginning of the present century. The causes in general are over-fishing, whereby the salmon are nearly all destroyed before reaching the spawning beds, or even before entering the rivers at all. The pollution of the rivers by manufacturers and their obstruction by dams has had much to do with the diminution of anadromous fishes. Another important element is the drainage of the land, the result of which has been that the high water on the rivers endures for a shorter time, and it is only when the streams are swollen that the salmon are ready to ascend them. The last of these causes cannot be made less potent, but with vigorous efforts in the direction of fish culture (see PISCICULTURE), and with protection for the spawning fish and the young, it may be possible to restore the productiveness of these streams. There is reason to think that the productiveness of the waters may be increased as much as that of the land. "In making comparison between the supplies of fish and of flesh, it must be kept in mind that fish, or at least salmon, though higher in money value [than sheep], cost nothing for their keep, bare no pasture, hollow out no turnips, consume no corn, but are, as Franklin expressed it, 'bits of silver pulled out of the water'" (Russel, *The Salmon*, p. 12).

The rental of the privilege on three salmon rivers—the Tay, the Spey, and the Tweed—"amounted, in 1873," according to Dr. Goode, "to nearly \$200,000. In this year 3,800,000 pounds of salmon, worth at least \$1,350,000, were brought to London markets, 2,580,000 pounds coming from Scotland alone. The salmon rivers of North America may be made to yield a harvest much richer than this; those of Maine are probably as

numerous and well adapted for the purpose as those of Scotland, which are valued at £250,000 a year, those of England being placed at £100,000, and those of Ireland at £400,000."

FOOD OF SALMON.—The salmon is a voracious and carnivorous fish, as is indicated by its strong dentition. It feeds freely on other fishes, as the herring, sand-lance, as well as on young salmon and trout. Crustaceans and their eggs also sometimes form an important part of its food. The red color of the flesh of the salmon is thought to be intensified by a diet of crustaceans.

ANGLING FOR SALMON.—The capture of the salmon by rod and line affords most exciting sport. The pleasures of it have been descanted on by numerous writers. Among the many modern English writers on the subject we may name Davy, Stoddart, Colquhoun, Younger, Stewart, Francis, and Russel. The tackle used is sufficiently described in the article **ANGLING**; and the general principles of fly-fishing there laid down are applicable in this case. The chief specialty in salmon angling is to be able to maintain perfect coolness and vigilance when the fish is hooked. The rod must be kept at such an elevation as to bring its elasticity into play; and by allowing the line to run out as the fish dashes off, and winding it up as he returns, or by following his motions, if need be, in person, a constant and equal strain must be maintained; a sudden tug at an unyielding line or a momentary slackening being equally fatal. After struggling for from a quarter to half an hour (sometimes, though rarely, for two or three hours) against a steady pull, the fish generally yields to his fate and allows himself to be drawn into the shallow and landed. This is done either with the gaff, or the fisher, winding his line up within rod length and holding the top landward, without slackening, seizes the fish with one hand by the root of the tail, and lifts or rather slides him head-foremost on to the gravel or grass.

SALMON TROUT.—Clearly allied to the salmon, and intermediate between it and the trout, is the salmon trout of Europe (*salmo trutta*), called also Peal, Sewen, Sea-trout, Blue Poll, etc. This large migratory trout is common in the waters of Northern Europe, ascending the rivers from the Loire to the Baltic. Its habits in general resemble those of the true salmon, but it is a smaller fish, less powerful, and commercially much less important. It reaches a length of nearly four feet, and a weight of 8 to 20 pounds.

STEEL-HEAD SALMON.—In the mouths of the Columbia River, and in other streams in the North Pacific, a similar species, *salmo gairdneri*, is found. This is popularly known as the "steel-head," and it has but little economic importance.

PACIFIC SALMON; ONCORHYNCHUS.*—In the North Pacific, on both coasts, ascending all the rivers are the five species of "king-salmon," composing the genus *oncorhynchus*. These species are (1) Quinnot, Chinook or King-Salmon, (2) the Blue-back Salmon or Red-fish, (3) the Silver Salmon, (4) the Dog Salmon, and (5) the Humpback Salmon; or (1) *oncorhynchus tshawytscha*, (2) *oncorhynchus nerka*, (3) *oncorhynchus kisutch*, (4) *oncorhynchus keta*, and (5) *oncorhynchus gorbuscha*. All these species are now known to occur in the waters of Kamtschatka, as well as in those of Alaska and Oregon. These species, in all their varied conditions, may usually be distinguished by the characters given below. Other differences of form, color, and appearance are absolutely valueless for distinction, unless specimens of the same age, sex, and condition are compared.

The Quinnot Salmon (*oncorhynchus tshawytscha*) has an average weight of 22 pounds, but individuals weighing 70 to 100 pounds are occasionally taken. It has about 16 anal rays, 15 to 19 branchiostegals, 23 (9 + 14) gill rakers on the anterior gill arch, and 140 to 185 pyloric cœca. The scales are comparatively large, there being from 130 to 155 in a longitudinal series. In the spring the body is silvery; the back, dorsal fin, and caudal fin having more or less of round black spots, and the sides of the head having a peculiar tin-colored metallic lustre. In the fall the color is often black or dirty red, and the species can then only be distinguished from the dog-salmon by its technical characters.

The Blue-back Salmon (*oncorhynchus nerka*) usually weighs from 5 to 8 pounds. It has about 14 developed anal rays, 14 branchiostegals, and 75 to 95 pyloric cœca. The gill-rakers are more numerous than in any other salmon, the number being usually about 39 (16 + 23). The scales are larger, there being 130 to 140 in the lateral line. In the spring the form is plumply rounded, and the color is a clear bright blue above, silvery below, and everywhere immaculate. Young fishes often show a few round black spots, which disappear when they enter the sea. Fall specimens in the lakes are bright red in color, hook-nosed and slab-sided, and bear little resemblance to the spring run. Young spawning male grilse are also peculiar in appearance, and were for a time considered as forming a distinct genus, under the name of *hypsifario kennerlyi*. This species appears to be sometimes land-locked in mountain lakes, in which case it reaches but a small size. In Alaska this is the most important species, exceeding in economic importance even the Quinnot Salmon itself.

The Silver Salmon (*oncorhynchus kisutch*) reaches a weight of 3 to 8 pounds. It has

* For a detailed account of the Salmon of the North Pacific and their habits, see articles in Jordan's *Science Sketches* (Chicago, 1888).

13 developed rays in the anal, 13 branchiostegals, 23 (10 + 13) gill-rakers, and 45 to 80 pyloric cæca. There are about 127 scales in the lateral line. In color it is silvery in the spring, greenish above, and with a few faint black spots on the upper parts only. In the fall the males are mostly of a dirty red.

The Dog-Salmon (*oncorhynchus keta*) reaches an average weight of about 12 pounds. It has about 14 anal rays, 14 branchiostegals, 24 (9 + 15) gill-rakers, and 140 to 185 pyloric cæca. There are about 150 scales in the lateral line. In the spring it is dirty silvery, immaculate, or sprinkled with small black specks; the fins dusky. In the fall the male is brick-red or blackish, and its jaws are greatly distorted.

The Humpback Salmon (*oncorhynchus gorbuscha*) is the smallest of the species, weighing from 3 to 6 pounds. It has usually 15 anal rays, 12 branchiostegals, 28 (13 + 15) gill-rakers, and about 180 pyloric cæca. Its scales are much smaller than in any other salmon, there being 180 to 240 in the lateral line. In color it is bluish above, silvery below, the posterior and upper parts with many round black spots. The males in fall are red, and are more extravagantly distorted than in any other of the *salmonidæ*.

Of these species the blue-back predominates in the Frazer River and in the streams of Alaska, the silver salmon in Puget Sound, the quinnat in the Columbia and the Sacramento, and the silver salmon in most of the streams along the coast. Only the quinnat has been noticed south of San Francisco. Its range has been traced as far as Ventura River. Of these species, the quinnat and blue-back salmon habitually "run" in the spring; the others in the fall. The usual order of running in the rivers is as follows: *Nerka*, *tschawytscha*, *kisutch*, *gorbuscha*, *keta*.

The economic value of the spring-running salmon is far greater than that of the other species, because they can be captured in numbers when at their best, while the others are usually taken only after deterioration.

The habits of the salmon in the ocean are not easily studied. Quinnat and silver salmon of all sizes are taken with the seine at almost any season in Puget Sound. This would indicate that these species do not go far north from the shore. The quinnat takes the hook freely in Monterey Bay, both near the shore and at a distance of six to eight miles out. There is reason to believe that these two species do not necessarily seek great depths, but probably remain not very far from the mouth of the rivers in which they were spawned. The blue-back and the dog-salmon probably seek deeper water, as the former is seldom or never taken with the seine in the ocean, and the latter is known to enter the Strait of Fuca at the spawning season, therefore coming in from the open sea. The great majority of the quinnat salmon, and nearly all the blue-back salmon enter the rivers in the spring. The run of both begins generally at the last of March; it lasts with various modifications and interruptions until the actual spawning season in November; the time of running and the proportionate amount in each of the subordinate runs varying with each different river. In general, the runs are slack in the summer and increase with the first high water of autumn. By the last of August only straggling blue-backs can be found in the lower course of any stream; but both in the Columbia and in the Sacramento the quinnat runs in considerable numbers at least till October. In the Sacramento the run is greatest in the fall, and more run in summer than in spring. In the Sacramento and the smaller rivers southward there is a run, beginning in December. The spring ascends only those rivers which are fed by the melting snows from the mountains, and which have sufficient volume to send their waters well out to sea. Those salmon which run in the spring are chiefly adults (supposed to be at least three years old). Their milt and spawn are no more developed than at the same time in others of the same species which are not to enter the rivers until fall. It would appear that the contact with cold fresh water, when in the ocean, in some way causes them to run toward it, and to run before there is any special influence to that end exerted by the development of the organs of generation. High water on any of these rivers in the spring is always followed by an increased run of salmon. The salmon-canners think—this is probably true—that the salmon which would not have run till later are brought up by the contact with the cold water. The cause of this effect of cold fresh water is not understood. We may call it an instinct of the salmon, which is another way of expressing our ignorance. In general, it seems to be true that in those rivers and during those years when the spring run is greatest, the fall run is least to be depended on.

As the season advances, smaller and younger salmon of these species (quinnat and blue-back) enter the rivers to spawn, and in the fall these younger specimens are very numerous. It is, however, probable that some of both sexes reproduce at the age of one year. In the Frazer River, in the fall, quinnat male grilse of every size, from eight inches upward, were running, the milt fully developed, but usually not showing the hooked jaws and dark colors of the older males. Females less than eighteen inches in length were rare. All of either sex, large or small, then in the river, had the ovaries or milt developed. Little blue-backs of every size, down to six inches, are also found in the upper Columbia in the fall, with their organs of generation fully developed. Nineteen twentieths of these young fish are males, and some of them have the hooked jaws and red color of the old males.

The average weight of the Quinnat in the Columbia, in the spring, is about twenty-two pounds; in the Sacramento, about sixteen. Individuals weighing from forty to

sixty pounds are frequently found in both rivers, and some as high as eighty, or even one hundred pounds are recorded. It is questioned whether these large fishes are those which, of the same age, have grown more rapidly; those which are older, but have for some reason failed to spawn; those which have survived one or more spawning seasons. It is probable that the majority of these large fishes are those which have hitherto run in the fall, and thus, having spawned not far from the sea, have survived the spawning season of the previous year.

Those fish which enter the rivers in the spring continue their ascent till death or the spawning season overtakes them. Probably none of them ever return to the ocean, and a large proportion fail to spawn. They are known to ascend the Sacramento to its extreme head-waters, about four hundred miles. In the Columbia they ascend as far as the Bitter Root Mountains and, at least, to the Spokane Falls, and their extreme limit is not known. This is a distance of six to eight hundred miles. At these great distances, when the fish have reached the spawning grounds, besides the usual changes of the breeding season, their bodies are covered with bruises, on which patches of white fungus develop. The fins become mutilated, their eyes are often injured or destroyed, parasitic worms gather in their gills, they become extremely emaciated, their flesh becomes white from the loss of oil; and as soon as the spawning act is accomplished, and sometimes before, all of them die.

When the salmon enter the river they refuse to take bait, and their stomachs are always found empty and contracted. In the rivers they do not feed; and when they reach the spawning grounds, their stomachs, pyloric cœca and all, are said to be no larger than one's finger. They will sometimes take the fly, or a hook baited with salmon roe, in the clear waters of the upper tributaries, but there is no other evidence known to us that they feed when there. Only the quinnat and the blue-back (there called red-fish) have been found at any great distance from the sea, and these (as adult fishes) only in late summer and fall.

The spawning season is probably about the same for all the species. It varies for each of the different rivers, and for the different parts of the same river. It doubtless extends from July to December. The manner of spawning is probably similar for all the species, but we have no data for any except the quinnat. In this species the fishes pair off; the male, with tail and snout, excavates a broad, shallow "nest" in the gravelly bed of the stream, in rapid water, at a depth of one to four feet; the female deposits her eggs in it, and after the exclusion of the milt, they cover them with stones and gravel. They then float down the stream tail foremost. In the head waters of the large streams unquestionably all die; in the small streams, and near the sea, an unknown percentage probably survive. The young hatch in about sixty days, and most of them return to the ocean during the high water of the spring.

The salmon of all kinds in the spring are silvery, spotted or not, according to the species, and with the mouth about equally symmetrical in both sexes. As the spawning season approaches the female loses her silvery color, becomes more slimy, the scales on the back partly sink into the skin, and the flesh changes from salmon red and becomes variously paler, from the loss of oil; the degree of paleness varying much with individuals and with inhabitants of different rivers.

As the season advances, the difference between the males and females becomes more and more marked, and keeps pace with the development of the milt, as is shown by dissection. The males have (1) the premaxillaries and the tip of the lower jaw more and more prolonged, both of the jaws becoming finally stronger and often extravagantly hooked, so that either they shut by the side of each other like shears, or else the mouth cannot be closed. (2) The front teeth become very long and canine-like, their growth proceeding very rapidly, until they are often half an inch long. (3) The teeth on the vomer and tongue often disappear. (4) The body becomes more compressed and deeper at the shoulders, so that a very distinct hump is formed; this is most developed in *oneorhynchus gorbusha*, but is found in all. (5) The scales disappear, especially on the back, by the growth of spongy skin. (6) The color changes from silvery to various shades of black and red, or blotchy, according to the species. The blue-back turns rosy-red, the dog-salmon a dull blotchy red, and the quinnat generally blackish. The distorted males are commonly considered worthless, rejected by the cannery and salmon-salters, but preserved by the Indians. These changes are due solely to influences connected with the growth of the reproductive organs. They are not in any way due to action of fresh water. They take place at about the same time in the adult males of all species, whether in the ocean or in the rivers. At the time of the spring runs all are symmetrical. In the fall all males, of whatever species, are more or less distorted. Among the dog-salmon, which run only in the fall, the males are hook-jawed and red-blotched when they first enter the Strait of Fuca from the outside. The humpback, taken in salt water about Seattle, have the same peculiarities. The male is slab-sided, hook-billed, and distorted, and is rejected by the cannery. No hook-jawed females of any species have been seen. It is not positively known that any fully hook-jawed male survives the reproductive act. If any do, the jaws must resume the normal form.

On first entering a stream the salmon swim about as if playing. They always head toward the current, and this appearance of playing may be simply due to facing the moving tide. Afterward they enter the deepest parts of the stream and swim straight

up, with few interruptions. Their rate of travel at Sacramento is estimated by Mr. Livingston Stone at about two miles per day; on the Columbia at about three miles per day. Those who enter the Columbia in the spring and ascend to the mountain rivers of Idaho must go at a more rapid rate than this, as they must make an average of nearly four miles per day.

The economic value of any species depends in great part on its being a "spring salmon." It is not generally possible to capture salmon of any species in large numbers until they have entered the rivers, and the spring salmon enter the rivers long before the growth of the organs of reproduction has reduced the richness of the flesh. The fall salmon cannot be taken in quantity until their flesh has deteriorated; hence the dog-salmon is practically almost worthless, except to the Indians, and the humpback salmon is little better. The silver salmon, with the same breeding habits as the dog-salmon, is more valuable, as it is found in the inland waters of Puget Sound for a considerable time before the fall rains cause the fall runs, and it may be taken in large numbers with seines before the season for entering the rivers. The quinnat salmon, from its great size and abundance, is more valuable than all the other fishes on Pacific Coast of the United States taken together. The blue-back, similar in flesh, but much smaller and less abundant, is worth much more than the combined value of the three remaining species of salmon.

The fall salmon of all species, but especially of the dog-salmon, ascend streams but a short distance before spawning. They seem to be in great anxiety to find fresh water, and many of them work their way up little brooks only a few inches deep, where they perish miserably, floundering about on the stones. Every stream, of whatever kind, has more or less of these fall salmon.

It is the prevailing impression that the salmon have some special instinct which leads them to return to spawn in the same spawning grounds where they were originally hatched. There is no evidence of this in the case of the Pacific Coast salmon. It seems more probable that the young salmon hatched in any river mostly remain in the ocean within a radius of twenty, thirty, or forty miles of its mouth. These, in their movements about in the ocean, may come into contact with the cold waters of their parent rivers, or perhaps of any other river, at a considerable distance from the shore. In the case of the quinnat and the blue-back, their "instinct" seems to lead them to ascend these fresh waters, and in a majority of cases these waters will be those in which the fishes in question were originally spawned. Later in the season the growth of the reproductive organs leads them to approach the shore and search for fresh waters, and still the chances are that they may find the original stream. But undoubtedly many fall salmon ascend, or try to ascend, streams in which no salmon was ever hatched. In little brooks about Puget Sound, where the water is not three inches deep, are often found dead or dying salmon, which have entered them for the purpose of spawning. It is said of the Russian River and other California rivers that their mouths in the time of low water in summer generally become entirely closed by sand-bars, and that the salmon, in their eagerness to ascend them, frequently fling themselves entirely out of water on the beach. But this does not prove that the salmon are guided by a marvelous geographical instinct which leads them to their parent river, in spite of the fact that the river cannot be found. The waters of the Russian River soak through these sand-bars, and the salmon instinct appears to lead them merely to search for fresh waters. This matter is much in need of further investigation.

Before the present exhaustive fishing on the Columbia and other rivers began, the salmon were abundant in them to a degree almost incredible. Mr. J. K. Lord (a naturalist in Vancouver Island) speaks of a stream "barely of sufficient depth to cover an ordinary sized salmon, yet I have seen that stream so filled that fish pushed one another out of the water high and dry upon the pebbles. . . . With one's hands only, or, more easily, by employing a gaff or crook-stick, tons of salmon could have been procured by the simple process of hooking them out." Elsewhere Mr. Lord says: "At Fort Hope, on the Frazer River, in the month of September, I was going trout-fishing in a beautiful stream, the Qua-que-alla, that comes thundering and dancing down from the Cascade Mountains cold and clear as crystal; these salmon were then toiling up in thousands, and were so thick in the fork that I had great trouble to ride my horse through. The salmon were in such numbers about his legs as to impede his progress, and frightened him so that he plunged vigorously and nearly had me off."

The Columbia River is the centre of the fishery for the salmon of the Pacific. Its products are shipped to every part of the world as Canned or Tinned Salmon. This industry was begun in 1866, when 4000 cases of salmon were placed on the world's markets. This met with a ready sale at \$16 per case of 48 one pound cans. The business rapidly grew until it became the leading manufacturing industry of the state of Oregon. In 1874 there were thirteen canneries, and the pack amounted to 350,000 cases, at \$6.50 each. On an average, three Quinnat Salmon are required to fill a case.

In 1883, the business reached its height. There were then about thirty canneries, putting up 689,000 cases valued at \$5 each. Since that date, although the number of nets has greatly increased, the effects of over-fishing have become more and more apparent, until in 1890 there were but nineteen canneries in operation. These put up 451,000 cases, valued at \$5.20 each. In the past 24 years (1866-90), 27,000,000 salmon have been canned on the Columbia.

In 1890 there were in operation on the Pacific Coast of North America ninety-two salmon canneries. Of these nine were in California, forty-one in Oregon and Washington, thirty in British Columbia, and forty-six in Alaska. The total product of these for 1890 cannot fall far short of 2,000,000 cases, or \$10,000,000, a value already far exceeding that of the salmon of the North Atlantic.

SALMONIDÆ, THE SALMON FAMILY. A family of Isospondylous, Physostomous fishes, comprising, as now restricted, about 80 species, although in beauty, activity, gaminess, quality as food, and even in size of individuals, different members of the group stand easily with the first among fishes. The following are the chief external characteristics which are common to the members of the family as here understood; the *Argentinidæ* and the *Salangidæ*, usually included with them, being here placed in separate groups:—

Body oblong or moderately elongate, covered with cycloid scales of varying size. Head naked. Mouth terminal or somewhat inferior, varying considerably among the different species, those having the mouth largest usually having also the strongest teeth. Maxillary provided with a supplemental bone, and forming the lateral margin of the upper jaw. Pseudobranchiæ present. Gill-rakers varying with the species. Opercula complete. No barbels. Dorsal fin of moderate length, placed near the middle of the length of the body. Adipose fin well developed. Caudal fin forked. Anal fin moderate or rather long. Ventral fins nearly median in position. Pectorals inserted low. Lateral line present. Outline of belly rounded. Vertebrae in large number, usually about sixty.

The stomach in all the *Salmonidæ* is siphonal, and at the pylorus are many (15 to 200) comparatively large pyloric cæca. The air-bladder is large. The eggs are usually much larger than in fishes generally, and the ovaries are without special duct, the eggs falling into the cavity of the abdomen before exclusion. The large size of the eggs, their lack of adhesiveness, and the readiness with which they may be impregnated, render the *Salmonidæ* peculiarly adapted for artificial culture.

The *Salmonidæ* are peculiar to the North Temperate and Arctic regions, and within this range they are almost equally abundant wherever suitable waters occur. Some of the species, especially the larger ones, are marine and anadromous, living and growing in the sea, and ascending fresh waters to spawn. Still others live in running brooks, entering lakes or the sea when occasion serves, but not habitually doing so. Still others are lake fishes, approaching the shore or entering brooks in the spawning season, at other times retiring to waters of considerable depth. Some of them are active, voracious, and gamy; while others are comparatively defenseless, and will not take the hook. They are divisible into nine easily recognized genera—*Coregonus*, *Plecoglossus*, *Brachymystax*, *Stenodus*, *Thymallus*, *Hucho*, *Oncorhynchus*, *Salmo*, and *Salvelinus*. The four genera last mentioned have been united into one *Salmo* by most European writers.

COREGONUS includes the various species known as white fish, and characterized in general by the small mouth, weak teeth, and large scales. They abound in the lakes of all Northern regions and are valued as food. Three species are found in Great Britain, twelve in America, and several in Siberia.

PLECOGLOSSUS is a small salmon with serrated teeth found in Japan and Formosa. It is an annual fish, dying after the spawning season which takes place the first year.

BRACHYMYSTAX is a large white-fish of Siberia, said to reach a weight of eighty pounds, but still known only by the skins brought back by Pallas nearly a century ago.

STENODUS, the "inconnu," is a form intermediate between the white-fish and Salmon, found in Arctic America and Siberia, a large silvery fish, pike-like in form, but with weak teeth and silvery scales.

THYMALUS is the well-known Grayling (q.v.), of the rivers of Europe and Northern America.

HUCHO, include the Danube Salmon, called Reo or Huch, a large voracious white-meated Trout, with slender body, conical head, and strong teeth. The single species, *Hucho Hucho* is said to reach a weight of sixty pounds. It spawns in June, digging deep holes in gravelly bottoms.

ONCORHYNCHUS includes the Pacific Salmon (see SALMON), *Salmo*, the Atlantic Salmon (see SALMON) and the various species true or black-spotted Trout (q.v.). The most highly specialized genus is that of *Salvelinus*, which includes the red-spotted trout, properly called Charr (q.v.), of which one species is found in Europe, five in America, and apparently several in Siberia.

SALMON TROUT. See SALMON.

SALM-SALM, FELIX, Prince, 1828-70; b. Austria; commanded a U. S. regiment during the late civil war, and rose to be brig.-gen. He went to Mexico at the end of the war, was one of Maximilian's aids-de-camp, and chief of his household, and was taken prisoner with him at Queretaro; but was soon released. He joined the Prussian army, and was killed at Gravelotte.

SALNAVE, SYLVAIN, 1832-70; b. Hayti; entered the army as a common soldier, rose to the rank of capt., and was prominent in the revolution of Geffrard, by which Faustinus

(q.v.) was overthrown. Considering himself poorly rewarded for his services in the revolution and in repulsing the Spanish invasion; he organized a counter-revolution, and in 1867 drove Geffrard from the state. In 1869 Dominique and Saget headed a third successful revolution and Salnave was put to death at Port-au-Prince, Jan. 15, 1870.

SALOMON, JOHANN PETER, an eminent musician, violin-player, and composer, b. at Bonn in 1745. When young, he was attached to the service of prince Henry of Prussia, for whom he composed several operas. In 1781 he visited Paris, and afterward London, where he met with so warm a reception that he was induced to settle there. His series of subscription concerts in London, in 1790, form an era in the history of music, in so far as they led to the production of Haydn's twelve grandest symphonies, known as the Salomon set. In 1800 Salomon retired from public life, but continued to compose songs, glees, and violin solos and concertos. He died in 1815, and was interred in Westminster abbey.

SALOMONS, Sir DAVID, 1797-1873; b. London; a banker of Jewish parentage, by special act of parliament made sheriff of London and Middlesex co. 1835, high sheriff of Kent 1839-40, elected alderman 1835-44. He refused to take the oath "on the faith of a Christian," and was not allowed to take his seat. He became a barrister in 1849, and was elected lord mayor of London 1855-56. He was the first English magistrate of Jewish parentage. He was 4 times elected M.P. for Greenwich, but on account of his peculiar ideas in relation to the oath he was ruled out until 1859, when its form received a modification allowing an Israelite to assume it. He was deputy lieut. for Kent, Sussex, and Middlesex, baronet of the United Kingdom, 1869. He published *A Defense of the Joint Stock Banks*, and several pamphlets on religious disabilities, persecutions of the Jews, currency, corn-laws, etc.

SALON, a French word signifying a drawing-room, a room devoted to the reception of company, and hence a periodic and intimate reunion of distinguished people, for conversational and social purposes. Such reunions have been very common in Paris, and have had a marked influence not only upon literature and manners but also upon politics. They have been likened to the porticos of the Athenians and the cubacula of the Romans, but the distinctive feature of most of the great French salons, the presence of a brilliant woman as hostess around whom revolved a circle of famous or titled guests, is more nearly paralleled in the levees of Aspasia. It finds a foreshadowing, also, in the courts of Margaret of Scotland and Margaret of Navarre, the lettered queens who surrounded themselves with poets and philosophers. But the first S. proper was that of the Hotel de Rambouillet where the fascinating Marquise de Rambouillet (q. v.) began, about the year 1608, to gather around her the greatest wits and statesmen and the first ladies of the day. Her charm was inherited by her eldest daughter Julia, who exercised a joint influence at the Hotel until she quitted it to marry the Marquis de Montansier. A few years afterward, 1648, the intellectual intercourse of their circle was rudely interrupted by the Fronde. Immediately after the cessation of political turmoil Mme. de Scudéry (q. v.) began her famous Saturday evenings at Rue de Beauce, which were attended by Conrart, Ménage, Balzac, Mme. de la Suze, Mme. de Sévigné, and other *beaux-esprits*, but were rather looked down upon by the nobility. The real successor of the Marquise de Rambouillet was Mme de Sablé who at her S. succeeded in bringing together the aristocracy of intellect and that of birth. Salons now began to multiply, and the system flourished until the middle of the present century. In the 17th c., besides those already mentioned, the salons of Ninon de l'Enclos and Mme de Scarron (afterward de Maintenon) were specially famous; in the 18th, those of Mme. du Deffand, of Mme Lespinnasse, of Mme Geoffrin, of Mme de Turpin, and of Mme Necker; and in the 19th., those of Mme. de Staël, of Mme. Récamier, of Mme. Roland, of Mme. Vigée le Brun, of Mme. de Girardin, of Mme. de Mohl were among the most conspicuous. Mme. de Mohl's reign in literary social life extended through nearly half a century, until her recent death. But these are only a few among hundreds of similar reunions. There were salons which were distinctively political, or literary, or philosophic, or infidel, or *dévots*. But the greater number aimed rather at a generous eclecticism which afforded meeting places for all sorts of talents and all shades of belief or unbelief. "Lion" hunting developed into a mania. A genuine mistress of a household in Paris, had no affections, no ties, save those of her S. She was wholly absorbed in thinking how she should make this more attractive than the S. of some other lady, who was usually her intimate friend, and whom she often hated as only intimate friends with rival interests can hate. She even came to look upon herself as having the exclusive ownership of some particular pet "lion." Thus early in this century Chateaubriand was the property of Mme. de Récamier, while Guizot was that of Princess Lieven; and it is amusing to read of the efforts which the insatiate Récamier made to capture the eminent statesman, and the loyalty with which he stood by the cause of his legitimate owner. The S. is a purely Parisian institution and has never been successfully transplanted. Hot-house efforts were indeed made by Rahel, the wife of Varnhagen von Ense, at Berlin, and by the Countess of Albany at Florence, and though these reunions undoubtedly promoted the best sort of social intercourse, the want of duration, regularity, and continuity debars

them from ranking with those popularly reckoned as salons. Even in Paris the S. has had its decline and fall and is now almost extinct, the reunions given by Mme. Adam being the last faint echoes of the ancient traditions. See LAMBER, JULIETTE.

SALON, THE PARIS (*Le Salon*), the distinctive title given to an exhibition of paintings, sculptures, and engravings in the Palais de l'Industrie, Paris, May 1 to June 22, in every year. The exhibition welcomes the works of any living artist, provided such works succeed in passing the critical examination of a jury of experts elected by the votes of the competing artists themselves. But veterans who have won medals, decorations, or the *prix de Rome* at prior exhibitions are exempt from this preliminary ordeal. These prizes are within the gift of the same jury, and are the object of eager competition. The *prix de Rome* is especially valuable to the young artist, as it entitles him to a three years' sojourn in Rome, at government expense, for the purpose of prosecuting his art studies. The Paris Salon is the precursor of the similar exhibitions in London and elsewhere. In 1663 Louis XIV., at the instigation of Colbert, decided that annual exhibitions of the works of art produced during the year by members of the Royal Academy of paintings and sculpture, should be held at the Palais Royal. It was afterwards determined that they should be held biennially, but the first exhibition did not take place until 1667, April 9-23, and subsequent ones occurred at variable intervals. In 1699 the exhibitions were transferred to the *Salon Carré* of the Louvre, whence they obtained their name. The Revolution abolished the special privileges of the members of the Royal Acad., and 1791, Sept. 8, opened the doors of the Salon to all French artists under nearly the same conditions as rule at present. In 1855 the Salon for the first time was held at its present quarters in the Palais de l'Industrie.

SALONA. See SPALATO.

SALONICA, or SALONIKI (anc. *Thessalonica*, Turk. *Selanik*), a t. of European Turkey, cap. of the vilayet of the same name, and, next to Constantinople, the greatest emporium of commerce in the empire, is situated on the gulf of Saloniki, and rises from the shore along the face of a hill. The city is inclosed by white walls, partly ancient and partly mediæval, and is surrounded by cypresses and other evergreens. As seen from the sea, it presents a bright and beautiful appearance; but its internal aspect is miserable in the extreme. The principal buildings are mosques, most of which were previously Christian churches. St. Sophia, now the chief mosque, was erected by Justinian somewhat after the plan of the metropolitan church at Constantinople; St. George, another mosque, is said to have been built by Constantine. The *Citadel*, called by the Turks *Vedi-Kuleh*, or "the Seven Towers," is the ancient Acropolis; within it are to be seen the ruins of a triumphal arch belonging to the time of Marcus Aurelius. Other relics of antiquity are the Propylæum of the hippodrome, a magnificent Corinthian colonnade of five pillars; the triumphal arch of Augustus, erected after the battle of Philippi (now forming the gate of Vardar or Vardari); the arch of Constantine, etc. There are steam flour-mills, soap and brick works, brewery, cotton mills, carpet works, and a government cigarette factory. Pop. 120,000 (est.), of whom 60,000 are Jews, 25,000 are Turks, 14,000 Greeks, 11,000 Slavs, and 3,300 French.

Salonica was at first called Therma, under which designation it is mentioned in connection with the march of Xerxes through Greece. It was rebuilt by Cassander about 315 B.C., who probably named it Thessalonica in honor of his wife; and during the Roman Macedonian wars, it figures as the principal station of the Macedonian fleet. After the close of the civil wars, its prosperity rapidly increased, and for three centuries it was the first city in Greece. It was early the seat of a Christian church. During the barbarian invasions, it proved the great bulwark of the eastern empire. It was thrice taken in the middle ages—first, by the Saracens in 904; secondly, by the Sicilian Normans in 1185; and thirdly, by the Turks under Amurath II. in 1430.

SALOOP. See SASSAFRAS.

SALOP. See SHROPSHIRE.

SALPA, a genus of mollusca, of the division *tunicata*, in which there is no shell, but a leathery tunic with two apertures; the type of the family *salpidae*, which float in the sea, and have the tunic transparent and elongated. They are allied to *ascidia* (q.v.), although not fixed like them, and have two openings, through the hinder of which the water enters, and is expelled through the anterior by a regular contraction of the mantle, so that the animal is impelled through the water in a backward direction, without any apparent voluntary action. The *salpæ* are sometimes solitary, and sometimes united in long chains, those in chains having the contractions of the individuals simultaneous; but the solitary *salpæ* appear to be the parents of those which are in chains, and they in turn give birth to solitary individuals very different from themselves. The whole texture is very delicate, so that the animal is sometimes scarcely to be discerned, except from its iridescent hues in the sunshine, which make chains of *salpæ*, when very numerous, a conspicuous feature in the surface of the great deep in tropical regions. The orifices of the alimentary canal are not near together, as in *ascidia*, but at opposite extremities of the body. The branchial chamber of *ascidia* is represented by a wide membranous canal, traversed by a long vascular ribbon, which is continually exposed to the water

that passes through the canal. The *salpæ* united in chains have no organic connection, but apparently adhere together by little suckers. See ZOOLOGY.

SALSETTE (native name *Sāshiti*), an island on the w. coast of British India, in the presidency of Bombay, lies immediately n. of Bombay, with which it is connected by a long peninsula and by an artificial embankment called Zion's causeway. The area is about 241 sq. m. Pop. '81, 108,149. It is beautiful, picturesque, and densely wooded, is diversified by mountain and hill, and contains many fertile tracts. Thana, the chief town, stands on the e. coast, 22 m. n.n.e. of Bombay by the Great Indian Peninsular railway, which, after traversing the islands of Bombay and Salsette, crosses to the continent half a mile to the s. of this town. Pop. '91, 17,455. A number of remarkable caves, called the caves of Kānhari or Kenery, are found in the middle of the island, 5 m. w. of Thana. They are nearly a hundred in number, are all excavated in the face of a single hill, and contain elaborate carving. The caves are in six stories, on the ledges of the mountain, and the stories are connected by stairs cut in the rock. The cave first approached consists of three chambers, one unfinished, and dates from the 9th or 10th c. A.D.; it contains no figures or carvings. The other caves contain numerous carved representations of Buddha, many of them of colossal size. One of them, the Buddhist Chaitya, is 88½ ft. long and 40 ft. wide, and is said to date from the 5th century A.D. Relics and inscriptions are also found. There are caves in several localities of the island besides those at Kānhari—e.g., those of Montpezir, Magatani, and Jageshwar. The caves are frequently the haunts of serpents and tigers. On the n., on the coast, is the small watering-place of Ghorā Bandar, which has been designated the Montpelier of Bombay. The fort of Thana and the island of Salsette were taken by the English in 1774.

SALSIFY, also *salsafy*, is a plant of the genus *Tragopogen* and belongs to the same family with the dandelion and lettuce. It is frequently called *oyster plant* on account of its peculiar flavor when cooked. It is indigenous to the Mediterranean region, though it grows spontaneously on the continent and in England; in America it is easily cultivated as a garden vegetable, requiring only a deep, rich soil, and care similar to that bestowed on carrots or parsnips, and, like the latter, it may be left in the ground during the winter. It is a biennial, producing a cylindrical root a foot or more in length, and always small in diameter. If allowed to grow the second season, it produces flower stalks three or four feet in height, having many branches, and each branch terminating in a large head of purplish flowers.

The *black salsify* is similar in appearance, except that it has yellow flowers, and the root is covered with a blackish skin, though the centre is as white as that of the former. There are many who prefer the latter on account of its flavor.

The *Spanish oyster plant* belongs to the same family with the thistles. It has large prickly leaves, speckled all over with white blotches, and its thistle-like flowers are a deep yellow. The root is used for food, except a hard portion in the centre, which is removed after cooking.

SALT. See **SODIUM**. Common salt is either procured in the solid crystalline state called *rock-salt* (q.v.), as a natural brine from wells or springs, or by the evaporation of sea-water. In the first case, it is obtained by mining, often at great depths, as at Northwich in Cheshire; at Salzburg, Magdeburg, Berchtesgaden, and Wimpfen in Germany; Cracow in Poland; in the Punjab and other parts of the world.

Rock-salt almost always contains impurities, and therefore is dissolved in water, and the insoluble matters mixed with it are deposited at the bottom. The brine is then drawn off and evaporated by artificial heat in large iron pans.

Natural brine is obtained at Droitwich and Stoke in Worcestershire, and Nantwich in Cheshire. At Droitwich the shaft is only sunk 175 ft., and the brine rises to the surface and overflows if not pumped. There are, however, reservoirs made for it, into which it is pumped, and from which it is distributed to the various works, which are little more than large sheds, with numerous openings in their roofs to allow the steam free egress. Flues run from end to end of the floors, and on these rest the iron evaporating-pans, which are about 65 ft. long by 25 broad, and about 18 in. in depth. In other places very deep shafts have been sunk, and the brine requires to be pumped from a great depth. The flues heat the brine nearly to boiling-point, and as a large surface is exposed, the evaporation is very rapid, and the crystals are small, as in the fine table-salt. If, however, the heat is more gentle, the salt is coarser, and is fit for curing meat, fish, etc.; and when very slow, a much coarser kind, called *bay-salt*, is produced. Salt is obtained from sea-water in many parts of the world, and this is effected by simply evaporating it in brine-pits or shallow square pools, dug on the shore for the purpose. When the evaporation has proceeded to a certain extent, the liquid assumes a reddish color; a pellicle of salt forms on its surface, which soon breaks and sinks down, to be followed by another; and the crystallization then proceeds rapidly. When complete, the salt is removed to sheds open at the sides, and then piled in heaps, in order that the chloride of magnesium may be removed. This is very easy, for as it is extremely deliquescent, it liquefies by exposure to the atmosphere, and runs out. The salt is then redissolved and crystallized, if great fineness is required.

Salt or sodium chloride—chemical symbol, NaCl—is an essential constituent of food, the use of which dates from the earliest ages. The Romans are thought to

have been the first to manufacture it. Many ancient philosophers treat of it scientifically, but the correct view of its composition as the chloride of sodium is of quite recent origin, Sir Humphrey Davy having first experimentally demonstrated it in 1810. Salt is present in every part of the human frame, organized in the solids and dissolved in the fluids. Besides its use as an article of food, immense quantities are consumed in the preservation of meats, etc., and for other industrial purposes. The annual rate of consumption varies in different countries, being estimated at 50 lbs. for each person in the United States, while in Great Britain it is 22 lbs., and in France only 15 lbs. The salt of commerce may be roughly classed under two general heads, that which is found in its crystalline state in deposits of rock salt, and that which is produced by the evaporation and purification of salt brines. Deposits of rock-salt are not confined to any one series of strata, but appear at various depths in the crust of the earth and in nearly every geological horizon. Thus the great English deposits in Cheshire and Worcestershire, as well as the deposits in France and Germany, occur in different members of the triassic group; the mines of Wielizka in Austrian Galicia, those at the base of the Carpathian mountains, those in Tuscany and Sicily, belong in the tertiary; in the Austrian Alps deposits exist in the oolitic limestone; and in other places they occur in the carboniferous and even in the Silurian strata. The deposits in Petit Anse island, Vermilion Bay, La., are only from 16 to 18 ft. below the surface, while those in Ontario, Canada, lie at a depth of fully 800 feet. Very little rock-salt, as such, is used either in England or in the United States, the large quantities mined in the former country being mostly exported. But the deposits of rock-salt are usually turned into artificial brines by dissolution in water while still in the mines, and the product of these brines furnishes much of the salt that is used in England. The natural brines must, of course, include the sea-water, which is largely depended upon in South and Central America, in the West Indies, and in southern Europe. Very little salt is made from sea-water in the United States—not more than 400,000 bush. annually. The natural brines proper are the salt springs and wells which result from the accidental dissolution of rock-salt deposits by passing currents of water. These are found with more or less frequency in almost every country; they abound in England, in northern Italy, in Prussia, and especially in Russia. Salt lakes also are frequent in the latter country, but in the Great Salt Lake in Utah the United States possesses the largest known inland body of salt water.

Manufacture.—The coarser qualities of salt are mostly made from sea-water or from brines by a natural process of evaporation, although they consist sometimes of rock-salt ground to a suitable size. Along the shores of the Mediterranean the evaporation is effected by exposing the sea-water in shallow basins to the influence of sun and air. In Russia, Sweden, and other northern countries, salt is obtained by freezing sea-water in large reservoirs. As the ice so formed is nearly pure, repeated congelations leave the mother liquor more and more impregnated with salt, and the residuum is finally boiled down. In New York, Kansas, Michigan, Ohio, and West Virginia there are many manufactories of coarse salt from the natural brines. By mere exposure in a series of shallow wooden vats, protected from the rain by movable covers, the liquid is first freed from its principal impurities, and then evaporated by solar heat—the coarse salt so obtained being largely used in the preservation of meat and fish. The most important of these establishments is at Onondaga, N. Y., where the finer grades of salt are also made. These finer qualities of salt, often known as boiled salt, result from the application of artificial heat to the brines. In many cases, however, and especially when the brines are weak and diluted, they are submitted to a preliminary process of evaporation in the air, which not only concentrates the liquid, but frees it from the carbonic acid and the ferrous carbonates with which it is frequently impregnated. This may be done in the wooden vats already mentioned, though a favorite process, superseding all others in Europe, consists in pumping the liquor up to a high reservoir and thence allowing it to trickle down through bundles of thorn or brush built up in the form of a wall, the great amount of surface thus exposed to the wind and sun causing very rapid evaporation. This preliminary process is called “graduation.” After the liquor has been sufficiently concentrated the separation of the salt is effected by artificial heat. This may be done in various ways, the most usual being those known as the kettle, the pan, and the steam processes. The first is peculiar to the United States, and is practiced especially in the Onondaga factories. Some 50 or 60 hemispherical iron kettles, capable of holding from 120 to 150 gals., are placed in a double row along a common flue, heated by fire-places at each end. At the bottom of each of these kettles a pan with a long handle is introduced, upon which are collected the impurities precipitated during the process of concentration. From time to time the pan is removed and cleaned until the salt crystals begin to appear, when it is not replaced. After the salt has separated it is washed in the remaining pickle, hung in baskets over the kettles, where it is drained for a few hours, and then emptied into the store-rooms. Here it remains for a couple of weeks—a law in New York state makes a two weeks drying in the store-room obligatory—and is then ready for the market. The pan process, not often practiced in this country, is a favorite in England. The brine, after it has been “graduated” to a sufficient specific gravity, is placed in large shallow iron pans called the “foreheaters,” where it is boiled until the impurities have been deposited, and then when it has almost reached the saturation point is run off into similar pans and evaporated to dryness. In the steam pro-

cess the graduated brine is placed in wooden vats called settlers, about 800 ft. long, 8 ft. wide, and 6 ft. deep, heated by means of a number of 4 in. steam pipes passing through them from end to end. The impurities having been deposited in the settlers, the liquid is drawn into other vats called "grainers," of the same length and width, but only a foot or two in depth. The salt forms very rapidly, and is lifted, drained, and stored in the same way as in the kettle process. The steam process is used in various places in the United States, particularly in the Saginaw valley in Michigan, where the kettle process is also practiced. The fineness of the salt in all cases depends upon the rapidity with which the evaporation is conducted, the most rapid boiling producing the finest grained salt. The United States is remarkable for the number of its salt manufactories; no less than 23 of the states are or have been actively engaged in the production of the various grades of salt. Of these New York and Michigan are the chief. The former state has produced as much as 9,053,874 bush. in a single year (1862), but since that time the yield has declined and does not now average 800,000 bush. a year. The saline springs are principally in Onondaga county, in the towns of Syracuse, Salina, and Geddes. They are the property of the state, which supplies the brine to manufacturers and receives a royalty of one cent per bushel. The salt industries of Michigan are of quite recent development, although as early as 1838 unsuccessful efforts had been made by the state authorities to work the valuable licks and springs. In 1859, prompted by the offer of a bounty of 10 cts. a bushel, offered by the legislature for salt made in the state, a company was organized in East Saginaw, and in a few years the production of salt had reached such extensive proportions as to largely encroach upon the market formerly commanded by New York. About 13,000,000 bush. are now made yearly in Michigan. West Virginia, Ohio, and Pennsylvania have each of them at different periods been among the leading states in the union in this branch of industry, but they have seriously declined of late years. In Indiana, Illinois, Kentucky, and the New England states, the business has become unproductive; in Missouri and Tennessee it has been abandoned. Some of the western states and territories, Kansas, Arkansas, New Mexico, Utah, and California, contain important saline springs and lakes, which have been only slightly worked as yet, and which with the settlement of the country will probably be fully developed. In Louisiana the deposit of rock-salt in Petit Anse (see SALT DEPOSIT IN LOUISIANA) yields over 300,000 bush. annually. The annual production of salt in the U. S. has increased from 17,606,105 bush., in 1870, to 29,805,298 bush., in 1880. There is still, however, a considerable importation, especially from Canada. The total value of the salt produced in the U. S. in 1880 was \$4,829,566.

Agricultural uses.—These are two-fold: first, as a fertilizer of the soil, and second, as a necessary article of food for farm stock. Salt can be only sparingly used as a manure; its effects depend so much not only upon the character of the crops, but also on the nature of the soil, that in the hands of an ignorant person it is liable to do more harm than good. In the rice fields of the east sea-water is said to have been used from a very early antiquity with beneficial results. In sandy soils, especially in those devoted to the cultivation of mangold-wurtzel, the English farmers have found salt very successful and it is also recommended as a top-dressing in pasture-lands, checking the rank growth of the grass, but greatly increasing its quality and succulence. Used in connection with nitrate of soda, in the proportions of two parts of salt to one part of nitrate of soda, the beneficial effects of the latter manure are largely increased. On stiff soils, however, salt is practically inoperative, and in many cases where its use has been recommended, as in the growth of cereals, cabbage, etc., experience has shown that it is of little or no benefit. As an essential portion of the food of live stock salt is a necessity upon every farm. Animals which are subject to lively exercise during the day are especially dependent upon salt for their health, and instances are not uncommon where beasts of burden have died for want of it. Milch cows, it is well known, need a daily allowance of salt in order to preserve the sweetness of their milk, and the quality of the fleece of sheep depends to a great extent upon their obtaining a sufficient measure of salt. A custom practiced by many farmers, which may be generally recommended, is that of keeping a stock of salt in the corner of a pasturage to which ready access is had by the cattle, there being no danger of their eating more than nature requires, except in cases where it had previously been denied them for an undue length of time.

Industrial uses.—It is estimated that more than one-half of the total amount of salt consumed in this country is used in the packing and preserving of meats and fish, and the preservation of the products of the dairy. In the case of beef and pork a small portion of saltpeter is often added to the salt, which withdraws the moisture from the meat. Sugar is also used in connection with salt in the curing of hams. For dairy purposes none but the finest grades of salt should be used; in the packing of beef and pork the coarser kinds are the best. It has often been suggested that salt might be employed advantageously in the seasoning of timber, but experience teaches that timber so seasoned is liable to contract moisture, with all the attendant evils of warping and increasing in bulk and in weight. Of course, in the case of wood-work constantly exposed to water, as in the joints and intersections of ships, this objection does not hold, and the experiment in such cases has often been tried with success. In refrigerating mixtures salt is invaluable, and in the manufacture of ice-cream large quantities of salt are annually consumed. As salt is the source from which soda is derived, it is really the

basis in the manufacture of soaps and glass. In the United States, however, very little salt is converted into soda, the latter article being principally imported. England turns fully one-half of its annual production of salt into soda-ash. Other chemical products of salt are the chlorine used in the bleacheries and hydrochloric or muriatic acid—the latter being formed in the manufacture of soda.

SALT, Sir **TITUS**, 1803–76; b. England, and educated at Wakefield; began business as a woollen manufacturer at Bradford, 1834; founded in 1853 near Shipley on the river Aire, a manufacturing village, called *Saltaire*. The factory works cover about 20 acres, and there are 1000 convenient dwellings for the operatives. He was mayor of Bradford; president of the chamber of commerce; a member of parliament for Bradford 1859–61; made a baronet in 1869. He was the head of the mercantile house of Titus Salt, Sons and Co. and liberally aided several benevolent institutions, schools, and libraries. He was remarkable for his care for the physical and moral welfare of his great host of work-people.

SALTA, a province in the n.w. of the Argentine republic, bounded by Bolivia, Santiago, Catamarca, Tucuman, and Jujuy; 45,000 sq. m.; pop. '95, 118,138. It is drained by the Teuco, Bermejo, Juramento, and very many other rivers. The surface is mountainous. The soil is remarkably productive; and among the many products are maize, wheat, oats, potatoes, sugar-cane, lucerne, and fruits. Copper, iron, the precious metals, asphalt, petroleum, coal, and china clay are found. Salt is obtained; and cattle, horses, wool, cheese, and tanned leather are exported.

SALTA, a town in the n.w. of the Argentine confederation, capital of a province of the same name, and about 145 m. n.w. of Tucuman. It stands on the banks of the upper waters of the Salado, at the height of 3,944 ft. above sea-level; but even with this elevation its climate is unhealthy. It is well built, contains a number of good edifices, and about 15,000 inhabitants.

SALT-CAKE is the term employed to designate the crude sulphate of soda made from oil of vitriol and common salt, and used in the preparation of carbonate of soda.

SALTCOATS, a seaport on the firth of Clyde, county of Ayr, 25 m. s.s.w. of Glasgow. Though its shipping trade has declined, Saltcoats is a thriving place, and a great resort of sea-bathers. Fine sea-salt is manufactured. Pop. '91, 5,895.

SALT DEPOSIT IN LOUISIANA, a remarkable deposit of rock-salt occurs on Petit (or Petite) Anse, a small island of Iberia parish, La., lying in a marsh near Vermilion bay, 10 m. s. of New Iberia in lat. 29° 50' n., long. 91° 55' w. Its discovery was accidentally made in 1861, an opportune time for the southern confederacy, as almost their entire supply of salt was drawn from this source during the later years of the war. The deposit is covered by a mere drift mass 16 to 18 ft. deep. It is 99.67 per cent pure, and so far as mined is found to lie in one solid mass without split or cleavage. Its dimensions have not been ascertained. A shaft has been driven through it to the depth of 1,000 ft.; it has been tunneled from e. to w.; and it has yielded an average of 36,000 tons per annum, a small part of its estimated capacity. In sinking the shaft a large number of fossil remains of human beings, and mastodons, mammoths, and other animals were found, together with pottery ware and stone implements. It is conjectured that the place formerly abounded in game, attracted thither probably by the salt-licks, and was consequently a favorite hunting-ground, but hunters and hunted seem to have been involved in a common catastrophe.

SALTER, **WILLIAM D.**, 1794–1869; b. N. Y.; entered the navy as midshipman 1809; rose through successive grades to capt. 1839; was commandant at the Brooklyn navy-yard 1856–59, and commodore on the retired list 1862. In 1863–66 he was inspector of vessels of war. In the war of 1812 he served on the *Constitution* in the engagement with the *Guerrière*, and was an officer of approved valor, distinguished for gallant services.

SALTILLO, a city of Mexico, capital of the state of Coahuila, 45 m. w.s.w. of Monterey. It is regularly laid out, contains a public square and fountain, and carries on manufactures of blankets and ponchos. Pop. '94, 22,801. Seven m. s. is Buena Vista, famous for the battle fought there, Feb., 1847, when the Mexican forces were repulsed by an inferior U. S. army.

SALTING, the process by which animal and vegetable substances are preserved for food by the aid of common salt. This is either done by rubbing dry salt into the flesh to be preserved, and repeating the process from time to time, until it has absorbed sufficient to arrest decomposition; or the salt is liquefied with a little water, and made into brine, in which articles are placed until required for use, when a little soaking and washing removes the superfluous salt. Vegetables are only salted in the latter way; and continental nations use it extensively for the preservation of various kinds of vegetable food for winter consumption. A little saltpeter is often added, and very much increases the efficiency of the common salt. See **ANTISEPTICS**, **FOOD**.

SALTIRE, one of the ordinaries in heraldry, its name of uncertain etymology, representing a bend-sinister conjoined with a bend-dexter, or a cross placed transversely like the letter X. Like the other ordinaries, it probably originated, as Mr. Planché suggests, in the clamps and braces of the shield. The form of the saltire has been assigned to the cross on which St. Andrew is said to have been crucified; hence the frequency of this ordinary in Scotch heraldry. A saltire is subject to the variations of being engrailed, invected, etc., and may be *couped*. When two or more saltires are borne in a shield, they are coupéd, not at right angles, but horizontally; and as they are always so treated, it is considered superfluous to blazon them as coupéd. Charges disposed in the form of a saltire are described as placed *saltireways* or *in saltire*. The former term is more properly applied to two long charges, as swords or keys, placed across one another (in which case the rule is, that the sword in bend-sinister should be uppermost, unless otherwise blazoned); and the latter to five charges placed two, one, and two.

SALT LAKE, a co. in n. Utah, s.e. of Great Salt Lake, intersected by the Jordan river, and traversed in the e. by the Wahsatch mountains; pop. 58,457; sq. m., 754. The soil along the base of the mountains is naturally barren, but is made fertile by irrigation. The co. is crossed by several railroads. The staples are wheat, hay, potatoes, wool, and butter. There are mines of gold, silver, and lead; many manufactories, and smelting works, flouring and saw-mills, tanneries, etc. Co. seat, Salt Lake City.

SALT LAKE CITY, city, capital of Utah, and co. seat of Salt Lake co.; on the Great Salt Lake and Hot Springs, the Rio Grande Western, the Union Pacific, and the Utah Central railroads; 37 miles s. of Ogden. It is in the Great Salt Lake valley, at the base of the Wahsatch mountains, and about 12 miles s.e. of the Great Salt Lake; has an altitude of 4334 feet above sea-level; and covers an area of about 12 sq. miles. The city was settled by Mormons under Brigham Young in 1847, and was laid out with much care. The area is divided into blocks 660 feet square, each block is sub-divided into eight lots, the streets cross each other at right angles, average 128 feet in width, and are bordered with shade trees and ditches which have a steady flow of water from the mountains. Nearly every ward contains a public square, and Liberty park in the suburbs has an area of 110 acres. The most noteworthy buildings are those connected with the Church of Jesus Christ of Latter-Day Saints, including the Great Temple, built of gray granite, completed in 1893 at an estimated cost of \$5,000,000; the Tabernacle, built chiefly of wood, at a cost of \$500,000, with an immense dome-like roof, one of the largest organs in the country, and a seating capacity of 13,000; the endowment house; the Lion, Beehive and Gardo houses, formerly residences of Brigham Young; the Assembly hall; and Zion's co-operative mercantile institution. Other buildings of note are the city and co. building, completed in 1894, at a cost of \$900,000; the Museum; the Deseret university; St. Mark's, Holy Cross, and Deseret hospitals; the old and new penitentiaries; the theatre and the opera house; Deseret national bank; and several hotels. The city is lighted by electricity, and has electric street railroads, excellent waterworks, public school property valued at \$1,000,000, several national and state banks, and many daily, weekly, and monthly periodicals. Pop. '90, 44,843.

SALTONSTALL, GURDON, 1666-1724; b. Mass.; graduated at Harvard in 1684; ordained pastor of the First church (Congregational), New London, 1691; was prominent in politics, and was elected governor of Connecticut in 1707, which position he held until his death. He was an eloquent speaker. He bequeathed £1000 to Harvard college.

SALTONSTALL, LEVERETT, LL.D., 1783-1845; b. Mass.; studied at Phillips academy, Exeter, N. H.; graduated at Harvard college in 1802; commenced practice of law in Salem 1805; and became eminent in his profession; was often member of the legislature; a state senator in 1831; mayor of Salem, 1836-38; member of congress, 1838-43. He was a member of the Massachusetts historical society, to which he contributed *Historical Sketch of Haverhill*. He bequeathed most of his library to Phillips academy, Exeter, and some money to the library of Harvard college.

SALTONSTALL, Sir RICHARD, 1586-1658; b. England; nephew of sir Richard, lord mayor of London in 1597; the ancestor of those in New England who bear that name, and one of the fathers of Massachusetts colony. He came to Massachusetts with Gov. Winthrop in 1630, was assistant-governor that year, and, with Mr. Phillips, commenced the settlement of Watertown; returned to England in 1631, where he continued the friend of the colony and a patentee of Connecticut.

SALTPETER. See NITER.

SALT RANGE, or KALABAGH MOUNTAINS, a mountain range in the Punjab, India, lies in an e. and w. direction, in lat. 32° 30'—33° 20'. The range rises on the w. bank of the Jhelum, runs w. to the Indus, and after affording a passage to the river, reappears on its w. side, and pursues the same direction till it meets with the Suleiman mountains. The Salt range is about 200 m. in length, and varies from 2000 to 5000 ft. in height. Its appearance is exceedingly bleak and barren; vegetation is seldom met with; there are no trees; and the bold and bare precipices which frequently occur give to the range a forbidding aspect. Rock salt is found in inexhaustible quantities, and so pure that after being pounded it is ready for use. A variety of other minerals are found.

SALT OF SATURN, an old name for acetate of lead.

SALT OF SORREL, the common name for binoxalate of potash.

SALT, SPIRITS OF, the old name for muriatic or hydrochloric acid.

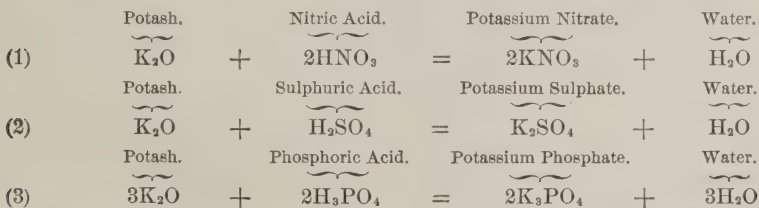
SALTS, SMELLING, a preparation of carbonate of ammonia with some of the sweet-scented volatile oils, use as a restorative by persons suffering from faintness. The pungency of the ammonia is all that is useful, and the oils are added to make it more agreeable. Oils of lavender, lemon, cloves, and bergamot are those chiefly used. The celebrated Preston smelling-salts are scented with oils of cloves and pimento. The manufacture of ornamental bottles to contain this preparation is an important branch of the glass and silversmith's trades.

SALTS, THEORY OF. Any substance which is produced by the combination of a base with an acid, is commonly termed a *salt*. The base is in most cases a metallic oxide, which is capable of uniting with an acid, and of more or less completely neutralizing the distinctive properties of the latter; in some cases, however, the base is non-metallic and organic in its nature, as in the case of ammonia, morphine, quinine, strychnine, creatinine, etc.

The salts derive their generic name from common salt, now known as chloride of sodium, but till the time of Davy regarded as a compound resulting from the union of hydrochloric (or, as it was then termed, *muriatic*) acid and soda. See **SODIUM**. Davy, however, showed that during their action upon each other, both the acid and the alkali undergo decomposition, and that while water is formed by the union of the oxygen of the alkali, Na_2O , and the hydrogen of the acid, HCl , the sodium of the former combines with the chlorine of the latter to form chloride of sodium, NaCl . Hence, strangely enough, the very substance from which the salts derive their name as a class was the means of overthrowing the old idea that a salt, as a matter of necessity, must result from the union of a base with an acid. It was then proposed to divide salts into two classes—those formed by the union of a base with an oxyacid, such as nitrate of potash, KNO_3 , formed by the union of oxide of potassium with nitric acid, sulphate of soda, Na_2SO_4 , carbonate of lime, CaCO_3 , etc., which were termed *oxysalts*; while the other class consisted, like chloride of sodium, of a metal combined with the characteristic element (chlorine, iodine, bromine, fluorine) in a hydrogen acid or hydracid (as, for example, hydrochloric, hydriodic, hydrobromic, or hydrofluoric acid). The salts of this second class, of which chloride of potassium, KCl , and fluoride of calcium, CaF_2 , may be quoted as examples, being constructed on the same plan or type as sea-salt, were termed *haloid salts* (q.v.), from the Greek word *hals*, the sea. The chlorine, iodine, bromine, or fluorine, which, in combination with a metal, forms a haloid salt, is by some writers termed a *salt-radical*.

Acids are now considered to be salts of hydrogen. In accordance with this idea, recent authorities write hydrogen chloride, hydrogen nitrate, and hydrogen sulphate, instead of hydrochloric acid, nitric acid, and sulphuric acid. Another view considers that acids are hydrates of acid-forming oxides, inasmuch as most of them can really be produced that way.

A salt is produced by the combination of a base with an acid-forming oxide, or by the reaction between a base and an acid; in the latter case water is always produced.



If hydrates of bases be used instead of bases the reaction is the same, only double the amount of water is produced.

Hence we see that when an acid acts upon a base to form a salt, the hydrogen of the acid unites with the oxygen of the base to form water, while the metal of the base takes the place of the hydrogen in the acid.

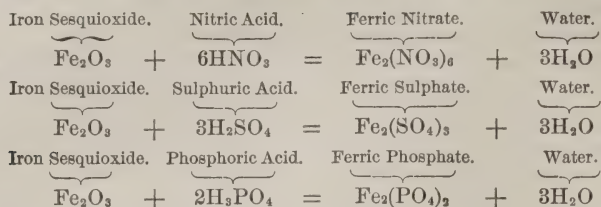
Salts are classed into several groups.

1. *Normal Salts*; also called *Neutral Salts*.

A salt is *normal* when the acid of which it is composed has all its replaceable hydrogen atoms substituted by a metal. To effect this substitution requires that the number of molecules of acid and of base shall be so taken that the hydrogen of the acid is just sufficient to combine with the oxygen of the base to form water.

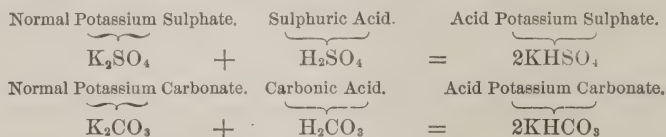
If the base be a monoxide, or contains one atom of oxygen, it will require two molecules of a monobasic acid, such as nitric acid, or one molecule of a dibasic acid, such as sulphuric acid, to combine with it. If the acid is tribasic, such as phosphoric acid, three molecules of base and two of acid are necessary to produce a normal salt. The above equations are examples. A sesquioxide requires six molecules of a monobasic

acid, three of a dibasic acid, and two of a tribasic acid to form a normal salt. Thus:



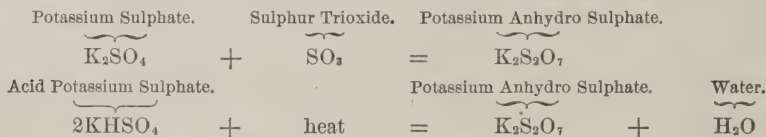
Normal Salts were formerly called *neutral salts*, since many of them are really neutral toward vegetable colors. Generally speaking, those salts formed by the union of a strong acid with a strong base are neutral; for example, potassium nitrate, KNO_3 , sodium chloride, NaCl , and calcium sulphate, CaSO_4 . Those formed from a strong acid and a weak base, as aluminium sulphate, $\text{Al}_2(\text{SO}_4)_3$, copper nitrate, $\text{Cu}(\text{NO}_3)_2$, are acid toward vegetable colors, while those resulting from a weak acid and a strong base, like sodium carbonate, Na_2CO_3 , sodium phosphate, Na_3PO_4 , usually exhibit an alkaline reaction.

2. *Acid Salts* arise when only a portion of the replaceable hydrogen in an acid is substituted by a metal; hence they can only be produced when the acid is a polybasic one. Acid salts are generally formed by dissolving the normal salt in a further quantity of acid, or by treating the base with an excess of acid.



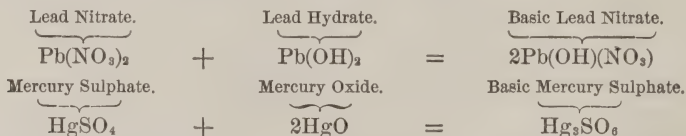
The acid salts often possess an acid reaction toward vegetable colors.

3. *Anhydro Salts*. The salts of this class are formed either by the union of a normal salt with an acid-forming oxide, or by heating an acid salt to expel water.



Potassium bichromate, $\text{K}_2\text{Cr}_2\text{O}_7$, and sodium biborate (borax), $\text{Na}_2\text{B}_4\text{O}_7$, are examples. Those salts of this class which are produced by heating an acid salt are frequently called *pyro salts*. It is noticeable that the water so expelled has, in the acid salt, fulfilled the part of a weak base; hence it is termed *basic water*. A few salts of the anhydro class occur in nature, notably some silicates and borates.

4. *Basic Salts*, or *Sub-salts*, as they are often termed, result from the combination of a normal salt with a hydrate of a base, or sometimes with the base itself. Thus, lead nitrate heated with lead hydrate forms a basic lead nitrate.



Basic mercury sulphate is commonly known as *turpeth mineral*. As examples of basic salts may be mentioned white lead, which is a basic carbonate of lead, $(\text{PbCO}_3)_2\text{Pb}(\text{OH})_2$, and the mineral malachite, which is a basic carbonate of copper, $\text{CuCO}_3\text{Cu}(\text{OH})_2$.

There is one other class of salts requiring a brief notice—viz., the *Double Salts*. Many neutral salts containing the same acid, but different bases, may be made to combine so as to form salts of the class now under consideration. Thus sulphate of potash and sulphate of alumina (both of which are neutral sulphates), by combining, give rise to the double salt popularly known as *alum*, and represented by the formula $\text{K}_2\text{SO}_4 + \text{Al}_2(\text{SO}_4)_3 + 24\text{Aq}$. Similarly, double salts of silicic acid are of common occurrence. Thus the varieties of feldspar are double silicates of alumina with potash, soda, lithia, or lime, but most commonly with potash, and they may be represented by the general formula $\text{M}_2\text{O}\cdot\text{SiO}_2 + \text{Al}_2\text{O}_3(\text{SiO}_2)_2$, where M_2O stands for potash or soda.

The salts at ordinary temperatures are solid bodies, with a strong tendency to crystallization, although a considerable number are amorphous. They may be either colorless or colored. When a colorless acid combines with a colorless base, the resulting salt does not exhibit color. A colored base combining with a colorless acid transmits its

color to the resulting salts, and if a colored acid combine with a colorless base, a similar but less marked result ensues. The salts usually have a decided taste, which is usually dependent on the base; the sulphites are, however, an exception to this rule, as their taste resembles that of the acid. They are variously influenced by high temperatures: some remain unchanged; while others volatilize, fuse, and either simply lose their water of crystallization, or become decomposed. Most salts are soluble in water, and some, as, for example, carbonate of potash and chloride of calcium, have so strong a tendency to dissolve in that fluid that they abstract the moisture of the atmosphere. Such salts are termed *deliquescent*. As a general rule, hot water exerts a far more powerful solvent action than cold. There are, however, some remarkable exceptions to this law. Thus, the solubility of common salt (chloride of sodium) is very nearly the same, whatever be the temperature of the water, and certain salts of lime are more soluble in cold than in hot water.

It has been already shown that a molecule of water enters into the composition of certain salts in precisely the same way as a molecule of any other base. Such water is termed *basic water*, and is an integral constituent of the salt, from which it cannot always be expelled by an ordinary heat. This water is quite distinct from the *water of crystallization*, which is taken up by many salts in a definite quantity, when crystallizing from water, and which is readily expelled by a gentle heat without altering the chemical properties of the salt. The crystalline form of salts which contain water of crystallization is much influenced by the proportion in which the latter occurs. Thus, green vitriol (sulphate of iron) crystallizes in two different forms and with two different proportions of water according to the temperature at which the salt separates from its solution. The number of equivalents of water of crystallization may vary from 1 to 24, which is the highest number yet observed. In order to distinguish the water of crystallization from water acting as a base, we characterize it by the symbol Aq. (from the Latin *aqua*, water). The ordinary phosphate of soda is represented by the formula $2\text{Na}_2\text{HPO}_4 + 24\text{Aq}$, or $\text{Na}_2\text{O} \cdot \text{Na}_2\text{O} \cdot 11\text{H}_2\text{O} \cdot \text{P}_2\text{O}_5 + 24\text{Aq}$. Many salts which contain water of crystallization (for example, sulphate or carbonate of soda) give off the whole or a part of their water of crystallization in a dry atmosphere, and crumble to powder; such salts are said to *effloresce*. Salts which contain no water of crystallization are termed *anhydrous*; of which niter, KNO_3 , is an example. All salts, when dissolved in water, are readily decomposed by the electric current, the base going to the negative, and the acid to the positive, pole. In consequence of this result the acid is termed the electro-negative, and the base the electro-positive constituent of the salts. When a haloid salt is similarly treated, the halogen (chlorine, etc.) is separated at the positive pole, while the metal is liberated at the negative pole.

SALT OF TARTAR, a commercial name for carbonate of potash in a very crude form.

SALT OF TIN is the term employed by the dyer and calico-printer for protochloride of tin, SnCl_2 , which is extensively used as a mordant, and for the purpose of deoxidizing indigo and the peroxides of iron and manganese.

SALT-WORT, *Salsola*, a genus of plants of the natural order *chenopodiaceæ*, having hermaphrodite flowers, with 5-parted perianth, and a transverse appendage at the base of each of its segments, five stamens and two styles, the seed with a simple integument. The species are numerous, mostly natives of salt-marshes and sea-shores, widely diffused. One only, PRICKLY SALT-WORT (*S. kali*), is found in Britain. It has herbaceous prostrate much-branched stems, awl-shaped spine-pointed leaves, and axillary solitary greenish flowers. It was formerly collected in considerable quantities on the western shores of Britain, to be burned for the sake of the soda which it thus yields. *S. sativa* is the chief barilla (q. v.) plant of the s. of Spain.

SALUTES, MILITARY. Military salutes are given by touching the hat or cap, presenting arms, lowering swords or colors, and firing cannon; in the navy, manning the yards, etc. The U. S. national salute is one gun for every state; the President's salute is twenty-one guns; the Vice-President's seventeen, and foreign ships are given a gun in response to each one they fire. Military Honors are accorded to a deceased officer or soldier when his body is accompanied to the grave by his comrades in military order, and either guns or musketry over it according to his rank. Honors of War are allowed to a conquered army, and depend entirely upon the General capitulating. With full honors, the troops are allowed to pass with drums beating and colors flying. Again, they are compelled to lay down their arms at a certain point and depart, while another General may demand that they return to their fortifications after having marched out, either silently or with drums beating, and surrender their arms. In our late civil war, Maj. Anderson, who was in command at Fort Sumter (April 14, 1861), and the first officer to surrender, was allowed to salute his flag with fifty guns, march out of the fort with drums beating and colors flying, and given all private property of officers and men. When Gen. Lee surrendered to the United States authorities at the close of the war (April 9, 1865), each officer was required to give his individual parole not to be found in arms against the United States until exchanged, and each Captain and Colonel was obliged to sign a like parole for his men. All arms, artillery, and public property

were to be turned over in good order to government officers. The side-arms, private horses and baggage of the officers they could retain. Gen. Johnston's surrender (April 26, 1865) was received upon the same terms.

SALUZZO, an episcopal city of northern Italy, in the province of Cuneo, at the foot of the Alps, 18 m. n.w. of Cuneo. It is a fine old city, and contains a semi-Gothic cathedral, built in 1480, with pillars of rare marbles, and colossal statues exquisitely sculptured, a seminary for priests, a royal college, a theater, and several schools. The tower of the Commune, an ancient and singular building, is worthy of notice; also the abbey of Staffarda, founded in 1135 by the marquis Tommaso I., and destroyed in 1341; an ancient civic palace, and the old castle, formerly the residence of the marquises of Saluzzo, now a penitentiary. Its products are grain, hemp, and wine; and its manufactures are silk fabrics, iron goods, and hats. Pop. of town, '81, 9716.

SALVADOR. See **SAN SALVADOR.**

SALVAGE, in maritime law, is the compensation which persons are entitled to receive, who in the absence of any obligation making it their legal duty, voluntarily save a ship or her cargo from loss by peril of the sea, which may be called civil salvage; or recover them after capture, which is termed military salvage. The whole subject lies under admiralty jurisdiction, and the method of procedure is by *libel*. The interest of the salvors is not joint, but several, and all may be joined in a libel. The salvage is to be regarded as a reward and encouragement for courage rather than as a payment *quantum meruit*. When the salvors are in possession they have a certain qualified property right in the ship, which does not, however, extinguish that of the owners. Except under very unusual circumstances the crew, pilot, officers, and passengers, are not entitled to salvage; as by duty and interest they are bound to do what lies within their power. But where the seaman's term of service has expired or the services necessary are entirely outside his ordinary duty, an exception is made, and similar exceptions are made in the other cases. Vessels belonging to the naval force of a country are bound to protect from mutineers ships sailing under the same flag, and are not entitled to salvage for such services. Where the first set of salvors are themselves assisted by a second set the salvage is divided according to the respective merits of the parties; but only great peril of the first set can justify interference on the part of the second. The rule is that only those who actually participate in the service can share in the reward, but the owners of the saving ship are allowed to obtain pay both for stores or provisions furnished and as salvage. The amount of the salvage to be paid is not fixed either by common law or by United States statutes, and the proportion will vary with the degree of danger incurred and the value of the services rendered. That maritime property is derelict which has been abandoned by the owners with no intention of return to it. Some attempt was made to establish the rule that the salvage on derelict property should be one-half; but all that can now be claimed is that higher salvage will be usually decreed in derelict cases than where an intention of returning is clear. Where no owner appears the English rule was that the property should be turned over to the crown by the lord high admiral. In the United States the property is held for a year and a day and then given up to the finder. Another distinction was formerly made between articles easily saved, such as coin or jewelry, and bulky things, but this no longer exists. While there is no absolute law regarding the distribution of salvage, the owners usually have one-third, the master twice as much as the mate, the mate double a seaman's share, and those who navigate the saved ship into port, or otherwise take the greater risk, double the share of those who remain on the salvor vessel. A claim to salvage may be barred by a contract, not extorted or unconscionable, to pay a fixed sum for the aid to be given. In such case the remedy for non-payment is at common-law and not at admiralty. Another bar is the existence of a custom of rendering assistance among vessels of the same class, as in the steam-boat navigation of the Mississippi. Theft of any of the saved property, fraud, negligence, or gross misconduct of any kind in the care of the property also acts as a bar. Salvage is on ship, cargo, or freight, but perhaps not on mails. Military salvage is given where a vessel is recaptured or saved from pirates or a public enemy, and in the war of the rebellion an award was decreed *as of* salvage, to parties who, after the capture of a harbor which had been under blockade, enticed blockade runners in.

SALVATION ARMY, was started in London, 1865, by William Booth, a Methodist evangelist who is now its general. Through his preaching, aided by that of his wife, thousands were added to the church; and in 1865, visiting the east of London, he was astonished at the great ignorance of the people, and gave himself up to their conversion. Out of those who gathered around him and who joined in the work, he organized the army, giving to its officers military titles. Its object is to wage war against sin among the lower orders. In England it has over 500 corps; and has divisions in all parts of the world. It publishes 27 weekly papers, whose circulation is 31,000,000. The first division in this country was established in 1880, under Commander Roillon; the organizations now number 329 in 38 different states. The principle of the army is to attract popular attention; hence the marching through the streets with banners and music. The members wear uniforms of blue trimmed with red braid, with the letter S on the shoulder; and the bonnets of the women have a red band around them with the words "Salvation Army." One of its principles is that as

women often are engaged in spreading evil they should aid in suppressing it. The army is thoroughly organized, and has a regular government, but no political tendencies. It does not take those who are already Christians, but seeks to reach those outside the ordinary influences of the church. All the members are expected to contribute funds, and any surplus after paying the expenses of the division is sent to the general fund. In the meetings they sing mostly in chorus, that all may join, and read striking passages of Scriptures sometimes making very forcible comments thereon. The success of the organization is largely traceable to the great enthusiasm which Gen. Booth and his singularly gifted wife have inspired in the members. The Salvation Army does not claim to be a church, and opinions about it in the churches are divergent. While its evident good effects are welcomed by all, its ultimate influence is questioned, and its future is regarded as doubtful. Meanwhile, it has certainly reclaimed large numbers from deepest vice, bringing them to a somewhat rude and often irreverent type of Christianity. In 1890 General Booth published *In Darkest England, and the Way Out*, a work proposing practical plans for the relief of the outcast population of the kingdom.

SALVIA. See **SAGE**.

SALVINI, ALESSANDRO, actor, son of the Italian tragedian Tommaso Salvini (q. v.), born at Rome, Dec. 21, 1861. He came to America in 1881, became an actor and played with Clara, Morris and Margaret Mather, and joined his father's company when the latter came to this country in 1885. His greatest successes were won in New York City, as Launcelot in *Elaine*, and Henry Borgfeldt in *The Partners*. His other plays included *Monte Cristo*, *Cavalleria Rusticana*, *The Three Guardsmen*, *Zamarr*, and *Hamlet*. He died in Florence, Italy, Dec. 15, 1896.

SALVINI, TOMMASO, b. Italy, 1829; a celebrated tragedian. His parents were actors. When quite a boy he showed a rare talent for acting, and was placed under the tuition of the great Gustavo Modena. After winning renown in juvenile characters, he joined the Ristori troupe. In 1849 Salvini entered the army of Italian independence, and received several medals in recognition of his services. After the war he played in the *Edipo* of Nicolini, a tragedy written expressly for him, and achieved a great success. He next appeared in Alfieri's *Saul*, and then all Italy declared that Modena's mantle had fallen on worthy shoulders. He then visited Paris, where he played *Orasmane*, *Orestes*, *Saul*, and *Othello*, and was received with great enthusiasm. In 1865 occurred the sixth centenary of Dante's birthday, and the four greatest Italian actors, Ristori, Rossi, Majeroni, and Salvini, were invited to perform in Silvio Pellico's *Francesca di Rimini*. In 1868 Salvini visited Madrid, and in 1874 came to America, where he was so well received that he returned twice. He acted in London (1875), and in Brussels (1877). In 1890 he retired from the stage, and in 1895 published *Ricordi, Aneddoti ed Impressioni*.

SALVO is a concentrated fire from a greater or less number of pieces of artillery. Against a body of men, a salvo is generally useless, as the moral effect is greater in proportion to the area over which devastation is spread; but with fortifications, the case is otherwise. For the purpose of breaching, the simultaneous concussion of a number of cannon-balls on masonry, or even earth-work, produces a very destructive result. At Almeida, after the French had fired a few salvos of 65 guns, the castle sunk in a shapeless mass. The effect of a salvo of modern artillery, with its enormous steel shot, against iron-plated ramparts, has never yet been tried in actual war. The concentrated fire of a ship's broadside forms a powerful salvo.

SALZBURG, a crown-land in the w. of Austria, bounded on the w. partly by Bavaria and partly by the Tyrol. Area, 2,767 sq. m.; pop. '90, 173,510. The principal mountain-ranges are the Noric Alps, which traverse the s. of Salzburg from w. to e. and rise in the Grossglockner to the height of 12,270 feet; and branches of the Rætian Alps, which separate the Tyrol from Salzburg and ramify throughout the middle districts of the latter, rising in the Ewiger Schneeberg to 9580 feet. Capital, Salzburg.

SALZBURG (anc. *Juvavia*), perhaps the most charmingly situated town in Germany, is the capital of the Austrian crown-land of the same name, and stands on both banks, but chiefly on the left bank, of the Salza, 73 m. e.s.e. of Munich. Here the river, banked on both sides by precipitous crags, rushes through what seems to be a natural gateway, and flows northward to its junction with the Inn. The picturesque situation of the city is thus described by Wilkie: "It is Edinburgh castle and the Old town brought within the cliffs of the Trosachs, and watered by a river like the Tay." The heights on either bank of the Salza are crowned with edifices. That on the left, called the Mönchsberg, is surmounted by the castle, called Hohen Salzburg, an irregular feudal citadel of the 11th c., and, during the middle ages, the residence of the archbishops of Salzburg, who combined the dignity of princes of the German empire with their ecclesiastical rank. The castle itself is now dismantled, but still serves as a barrack. A statue of Mozart (q.v.) adorns one of the squares. Opposite Mönchsberg is the Capuzinerberg, with a convent. The cathedral, a large and beautiful Italian edifice, was built in the early part of the 17th century. The chapel of St. George, built in 1502, is noted for its sculptures of the apostles, executed in red marble. The city is surrounded by walls, here and there dismantled, and the bastions are for the most part in a state of decay.

The city is the seat of an archbishop, and contains numerous libraries, museums, and educational and other institutions, among which is an upper gymnasium. The university has not been open since 1810. It carries on manufactures to some extent, is in communication with Vienna, Munich, and Innsbruck by railway, and has a considerable transit trade. Pop. '90, 27,244.

SALZKAMMERGUT, called also the *Austrian Switzerland*, one of the most picturesque districts of Europe, forms the s.w. angle of the crown-land of Austria ober Enns, between the crown-lands of Salzburg on the w. and Styria on the east. Area, 577 sq. m.; population 50,000, of whom 5,600 are Protestants. The scenery combines in rare beauty the usual features of valley, mountain, and lake. The vales are clothed with a rich verdure, and are studded with clumps of fruit and forest trees; the mountains are covered with beeches and oaks; higher up with pines and larches, and in some instances are topped with everlasting snow. The highest group, the Dachsteins, reach an altitude of 9,416 feet. But the district derives its reputation for beauty chiefly from its lakes, the largest and most famous of which are the Hallstadt and the Traun, or Gmunden lakes. They are bordered with lofty mountains, which rise sheer from the surface of the water; and their pit-like character, and the strong light and shade thrown on them from the mountains, combine to render the scenery of which they form the center unusually sublime. The Hallstadt and Traun lakes are connected, and indeed formed by the river Traun. The district of Salzkammergut derives its name from the salt, which is obtained in enormous quantities from its springs and mines. Salt being a government monopoly in Austria, the works are under the management of the *Kammer*, or exchequer.

SAMANA. See SAN DOMINGO (DOMINGO, SAN).

SAMANĀ AND **DILEMI** were two dynasties which divided between them the kingdom of Persia toward the beginning of the 10th century. They both rose to power through the favor of the caliphs, but they speedily threw off the yoke. The Dilemi, divided into two branches, exercised sovereign authority in Kerman, Irak, Fars, Khuzistan, and Laristan, always acknowledging their nominal dependence on the caliph; and during the whole period of their rule, one of the southern branches of this family was vested with the dignity of *emir-ul-omra*, or vizier, and managed the affairs of the caliphate. Several of the Dilemi were able and wise rulers, as the remains of their works of irrigation and other structures amply testify; but Mahmud of Ghizni put an end to the rule of the northern branch in 1029, and the Seljuks subjugated the southern one in 1056, by the capture of Bagdad, their last stronghold. Their more powerful rivals, the *Samani*, had obtained from the caliph the government of Transoxiana in 874 A. D.; and to this, Ismail, the most celebrated prince of the family, speedily added Khaurezm, Balkh, Khorassan, Seistan, and many portions of Northern Turkestan. Rebellions of provincial governors distracted the Samanide monarchy toward the end of the 10th c., and in 999 A. D. their dominions n. of Persia were taken possession of by the khan of Kashgar, the Persian provinces being added by Mahmud of Ghizni to his dominions.

SAMAR, one of the Philippine islands (q. v.).

SAMARA', a frontier government of Russia, bounded on the e. by the Kirghiz steppes, and on the w. by the governments of Saratov, Simbirsk, and Kazan. Area, 58,321 sq. m.; pop. '94, 2,765,001. It was erected into a government by ukase of Dec., 1850, and was formed out of portions of the governments of Simbirsk, Orenburg, and Saratov. The Volga, which forms the western boundary, and its affluent, the Samara, are the chief rivers. The country is very fertile, and agriculture and fishing are among the chief employments of the inhabitants. Large quantities of grain are exported. Manufactures are increasing. It suffers considerably from droughts. Chief town, Samara (q. v.).

SAMARA, capital of the Russian government of the same name, on the left bank of the Volga, at the junction of that river with the Samara. It is the chief grain-market on the Volga, and it contains numerous store-houses, especially for grain. A good trade in salt, fish, caviare, and tallow is also carried on. The city's trade is increasing, and at present it is the chief center of trade for the Kirghiz steppes and for the lower Volga. Pop. '97, 91,659.

SAMARANG', an important seaport on the n. of Java, 55 m. n. of Jokjokarta in 6° 57' 20" s. lat., and 110° 26' 30" e. long., is the capital of the residency, and the point to which the produce of Middle Java is brought for exportation to Europe. Pop. '93, 72,919. The city lies on the right bank of the river Samarang. A railway to the Vostenlanden (princes' lands), 126 m. long, was completed in 1874. The Chinese, Malays, and Arabians have their own captains, and quarters of small, dark, dirty houses. The Europeans dwell partly along the seashore, but chiefly on the left of the river, by the shady road to Bodjong, the resident's house, which is 2 m. from the city. The Protestants and Roman Catholics have each a church, orphan house, and school. There are public and private schools, an excellent hospital and other charitable institutions.

Only small vessels can enter the river. The roadstead is exposed to the west wind, and is dangerous during the rainy season. Besides the usual trades, the natives work in gold, silver, copper, and tin. Coffee, rice, sugar, tobacco, and indigo are the chief exports, an agent of the Netherlands Trading Company being established at Samarang to attend to the government trade. The pop. of the residency of Samarang amounted (1891) to about 1,497,987 souls, 2,163 being Europeans, 19,559 Chinese, and 843 Arabs.

SAMARCAND' was in the 14th c. the capital of the great Tartar empire of Timur. It has since remained the center of Mohammedan learning in Central Asia. It was till 1868 the second city of the khanate of Bokhara, and since that period annexed to the dominions of the czar, it has become one of the chief towns of Russian Turkestan. It is in lat. 39° 40' n., and long. 67° 3' e., 4 English m. s. of the Zer-Afshan (a river which "loses itself in the sands"), and 230 m. s.w. of Tashkend. It is situated at the foot of mount Chobanata, in a plain of exuberant fertility; and when seen from a distance, its glittering minarets, lofty domes, and prominent edifices and ruins, relieved by the brilliant green of the closely planted gardens interspersed within the walls, present an imposing effect. The river for centuries has been changing its course, and Samarcand has followed it—so that it consists of a "new city," and the ruins of those which preceded it. The "new city" is surrounded with walls, pierced with six gates, and is filled with narrow streets and lanes, which have, however, undergone many improvements since the Russian occupation. The population, which in the 14th c. exceeded 100,000, has dwindled to 54,900 (1897). The inhabitants consist chiefly of Tajiks and Usbeks. They are chiefly employed in the manufacture of silk, wool, and cotton. The old or "ruined city" is the portion most interesting to Europeans, as the capital of that mighty conqueror who wielded the scepter of Asia from China to the Hellespont. Many of the ruins belong to this epoch, among which are the Hazreti Shah Zinde, at one time supposed to have been a summer palace of Timur, but now shown to have consisted of tombs and chapels only. In the center of the city, separated from each other by a wide open space, stand three medresses, or sacred colleges. Each consists of a large quadrangular court, surrounded by a range of two-storied buildings, with chambers occupied by teachers and pupils. One of the objects of interest in Samarcand is the palace of the emirs of Bokhara, built within the citadel, where, before the Russian conquest, they were in the habit of spending the summer months with their harem suite. In one of the courts is the famous Kuk-tash, or green-stone, which served as Timur's throne. The palace has now been converted by the Russians into an hospital. Samarcand was the ancient *Maracanda*, the capital of Sogdiana. It was seized by the Arabs 707 A.D., and from this time belonged either to the caliphate or to some of the dynasties which were offshoots from it, till 1219, when it was taken by Genghiz Khan. In 1359 it was captured by Timur, and ten years afterward became the capital of his empire. It remained the chief town of Turkestan till 1468, when it declined in importance with the rise of the Usbeks. It retained, however, its position as the chief seat of Mohammedan learning in Asia. Until recently it had been visited by only four Europeans—in 1404 by the Spaniard Clavijo, in 1841 by Lehmann and Chanykow, and in 1863 by Vambéry. But in May, 1868, the gates of Samarcand were opened to the Russians (see **BOKHARA**), and they have since retained possession of the city. The inhabitants have manifested less antipathy to the rule of the infidel than might have been expected, from the reputation of Samarcand as a seat of Mohammedan fanaticism. The Jews have prospered by the encouragement given to trade; and the Tajik population have shown, as in the other cities of Turkestan annexed by Russia, good-will toward their conquerors, and a desire to adopt European ideas.—See Vambéry's *Travels in Central Asia* (Lond. 1864), and paper on "Ruins of Samarkand," by Prof. Fedchenko, in *Proceedings of Royal Geographical Society*, Dec., 1871.

SAMARIA (Heb. *Shomerôn*, Chald. *Shamrayin*, Septuagint, *Samareia*, *Semerôn*, etc.) anciently a city of Palestine, the chief seat of the Ephraimitic Baal-worship, and from the seventh year of Omri's reign, the capital of the kingdom of Israel. It was beautifully situated on a hill about 6 m. n.w. of Shechem, and probably derived its name (which may be interpreted "pertaining to a watch" or a "watch-mountain") from the position of the hill, which rises from the center of a wide valley, and commands an extensive prospect; but an eponymous etymology is adopted by the writer of 1st Kings, who says (chap. xvi. verse 24): "And he [Omri] bought the hill Samaria of Shemer for two talents of silver, and built on the hill, and called the name of the city which he built after the name of Shemer, owner of the hill, Samaria." The date assigned to Omri's purchase is 925 B.C., from which time Samaria became the seat of government, which had been formerly at Thirsa. It was twice besieged by the Syrians (901 B.C. and 893 B.C.), under Ahab and Joram, on both occasions unsuccessfully; but in 721 (720) B.C., it was stormed by Shalmaneser, king of Assyria, after a three years' siege. Its inhabitants, together with those of all the other "cities of Samaria" (which had become the general name for the country itself in which the city stood), i.e., the kingdom of Israel—or the "ten tribes"—were then carried off into a captivity from which they never returned. Their place was supplied, after a time, by colonists, planted there by Shalmaneser and Esarhaddon, from Babylon, Cuthah, Ava, Hamath, and Sepharvaim (according to 2d Kings, chap. xvii. verse 24; Media and Persia, Josephus's *Antiquities*, x. 9, 7), who constituted the original body of the people subsequently known as Samaritans, but whose bulk was gradually increased by accessions of renegade Jews and others. The question has been much, and on the whole unprofitably, discussed, whether these so-called "Samaritans" were a mixed race of remnant Israelites and heathen Assyrians, or whether they were exclusively the latter. The mere language of Scripture, strictly construed, seems to favor the second of these views, unless the term "cities" of 2d Kings, xvii. 24, is intended to imply that the ancient inhabitants dwelt in the open country. On the other

hand, we find, apart from the other reasons against so unparalleled a wholesale deportation, Israelitish inhabitants under Hezekiah and Josiah, both in Ephraim and Manasseh. Modern authorities therefore assume that they were, to a certain extent, what they always insisted on being, Israelites—(not Jews), i.e., a people largely intermixed with Israelitish elements, that, during the exile, had adopted the worship of Jehovah. The returning Jews, however, would not recognize their claims to the participation in the national *cultus* and temple, and a bitter antagonism sprang up between the two nationalities. In 409 B.C. a rival temple was erected on Mt. Gerizim, and a rival priesthood and ritual organized, and henceforth the breach, for some periods at least, became apparently irreparable—"the Jews had no dealings with the Samaritans," and *vice versa*. At other periods, however, a more friendly intercourse seems to have taken place between them. The rabbinical laws respecting the "Kushites" (Cuthim), as they were called by the later Jews, are therefore strangely contradictory, and their discrepancies can only be explained partly by the ever-shifting phases of their mutual relations, and partly by the modifications brought about in the Samaritan creed itself. The later history of the city of Samaria is somewhat checkered. It was captured by Alexander the Great, when the "Samaritan" inhabitants were driven out, and their place supplied by Syro-Macedonians. It was again taken (109 B.C.) by John Hyrcanus, who completely destroyed it. Soon rebuilt, it remained for the next 50 years in possession of the Jews; but Pompey, in his victorious march, restored it to the descendants of the expelled Samaritans, who had settled in the neighborhood, and it was refortified by Gabinius. Herod the great rebuilt it with considerable splendor, and called it Sebaste, in honor of the emperor Augustus, from whom he had received it as a present. In the 3d c. it became a Roman colony and an episcopal see. Its prosperity perished with the Mohammedan conquest of Palestine; and at present it is only a small village called Sebastieh, an Arab corruption of Sebaste, but contains a few relics of its former greatness. "Samaritans," as a religious sect, still exist at Nablus (anc. Shechem), as they have existed in the district uninterruptedly through all the vicissitudes of war and conquest from the time of Christ. Their present creed and form of worship agree in many particulars with that of the so-called "rabbinical" Jews, although the Samaritans pretend utterly to reject the "traditions." They alone, however, have retained the paschal sacrifice of a lamb. The language of the ancient Samaritans is a Hebræo-Aramaic dialect, but contains a number of non-Semitic (Cuthæan) words. It only survives in a few fragments of ancient literature, a translation of the Pentateuch, and some liturgical pieces. The present inhabitants speak Arabic.—See Dr. Robinson's *Biblical Researches*, Raumer's *Palästina*, and Dean Stanley's *Sinai and Palestine*, etc.*

SAMARITAN PENTATEUCH, a recension of the commonly received Hebrew text of the Mosaic law, in use with the Samaritans, and their only canonical book of the Old Testament. Some vague allusions in some of the church fathers (Origen, Jerome, Eusebius), and one or two more distinct, but less generally known Talmudical utterances respecting this recension, were all the information available up to the early part of the 17th c. (1616), when Pietro della Valle acquired a complete codex from the Samaritans in Damascus. Since then, the number of manuscripts of the Samaritan Pentateuch, with and without translations (in Arabic), has considerably increased in European libraries: and fragments, consisting of special books or chapters, are of the most frequent occurrence. In fact, writing portions of Samaritan Pentateuch on the oldest of skins, would, in the face of the great demand for the article on the part of ignorant European, especially English, travelers, appear to be a favorite and lucrative pastime, if not an established trade and business, among the modern Samaritans.

These MSS. are written in the Samaritan character, a kind of ancient Hebrew writing, probably in use before, and partly after the Babylonish exile, and vary in size from octavo to folio, the writing being proportionately smaller or larger. Their material is vellum, or cotton paper, and the ink used is black, with the exception of the Nablûs MS., which is written in gold. There are neither vowels, accents, nor diacritical points, the single words are divided from each other by dots. None of the MSS. that have reached Europe are older than the 10th century. The Samaritan Pentateuch was first edited by J. Morinus in the Paris *Polyglott* (pt. iv. 1632) from one codex (whence it found its way into Walton), and was last re-edited, written in the square Hebrew characters, by B. Blayney, Oxford, 1790. The first publication of this strange document, and principally the *Exercitationes Ecclesiasticæ*, with which J. Morinus accompanied it, mark a certain epoch in modern biblical investigation; for, incredible as it now appears, it was placed by Morinus and his followers far above the received Hebrew text, which was said to have been corrupted from it. As reasons for this, were adduced its supposed superior "lucidity and harmony," and its agreement with the Septuagint in many places. This opinion, which could only have been entertained by men devoid of knowledge, was zealously cherished, and fiercely combated for exactly 200 years, when the first proper and scientific investigation (by Gesenius) set it at rest, once for all, among the learned world at least. This absurd notion chiefly owed its popularity to the anti-Jewish as well as anti-Protestant tendency of its supporters, to whom every attack against the received form of the text—that text upon which alone the reformers professed to take their stand, was an argument in favor of the Roman Catholic dogma as to the "rule of faith" (q. v.).

This boasted superiority *en bloc*, gradually dwindled down to two or three passages, in which the Samaritan reading seemed preferable, and even these have now been disposed of in favor of the authorized Masoretic text. The variants, which Gesenius was the first to arrange systematically, present simply the ordinary aspect of partly conscious, partly unconscious corruptions. They arose, for the greatest part, from an imperfect knowledge of the first elements of grammar and exegesis. Others owe their existence to a studied design of conforming certain passages to the Samaritan mode of thought, speech, and faith, more especially to show that Mt. Gerizim was the spot chosen by Jehovah for his temple. There are, however, only two essential alterations respecting the Mosaic ordinances themselves to be found, one, Exod. xii. 7, where the Samaritan Pentateuch has "six days shalt thou eat unleavened bread," instead of "seven," and Deut. xxiii. 17, where our "shall be no" is altered into "shall not live." A chronological peculiarity deserves special mention—viz., that no one in the antediluvian times begets his first son in the Samaritan Pentateuch after the age of 150, either the father's or the son's age being altered in proportion; after the deluge, however, the opposite method is followed of adding 50 or 100 years to the father's years before the begetting of a son. We will only further add that anthropomorphisms, as well as anthropopathisms, are most carefully expunged, and that in Deut. xxvii. 4, Gerizim is wilfully substituted for Ebal.

It is, in the absence of a critical edition, exceedingly difficult to do more than speculate on the age and origin of the Samaritan Pentateuch, and opinions remain indeed widely divergent. The principal opinions on the subject are, briefly, either that it came into the hands of the Samaritans as a natural inheritance from the Jewish people, whom they succeeded at the time of the Babylonish exile; or that it was brought to them by Manasse (Jos. *Ant.* xi. 8, s. 2, 4), when the Samaritan sanctuary on Mt. Gerizim was founded; or, again, that the Israelitish priest sent by the king of Assyria to instruct the new settlers in the religion of the country, brought it with him. Of other more or less isolated opinions, only that one deserves further notice, that it was a late and faulty recension, into which glosses from the LXX. (Septuagint) were received. This agreement between the LXX. and the Samaritan Pentateuch, to which we have already alluded, has likewise given rise to many speculations and suggestions. The foremost of these are that the LXX. have been translated from the Samaritan Pentateuch; that mutual interpolations have taken place; that both versions were formed from Hebrew codices, differing among themselves, as well as from the authorized recension; and that many wilful corruptions have been superadded at a later time; finally, that the Samaritan has been altered from the LXX. There is also a translation of the Samaritan Pentateuch (which is Hebrew) into the Samaritan idiom; it is ascribed by the Samaritans to their high-priest, Nathaniel, who died 20 years before Christ. It was probably a kind of popular version, like the Targums (q.v.), and was composed, very likely, shortly before the destruction of the second temple. The translation is done in the most slavish and incompetent manner. Another Arabic version is due to Abu Said, in Egypt (1070), based on Saadiah's translation; and to this Samaritan-Arabic translation, a Syrian, Abu Barachat, wrote, in 1208, a commentary, which is sometimes erroneously taken to be an independent Syriac version of the Samaritan Pentateuch. Among the principal modern writers on the Samaritan Pentateuch are Gesenius, Kirchheim, and Deutsch.

SAMARITAN LANGUAGE AND LITERATURE. I. The language is made up of the Aramaic and the Hebrew, and sometimes uses forms of both in close connection. The alphabet contains 22 letters, arranged in the Hebrew order, resembling in form the ancient Hebrew and Phœnician, and pronounced like the Hebrew, except that the gutturals, being quiescent and weak, interchange freely with one another. The words are the same as in the Hebrew and Chaldee, with additions from the Arabic, Latin, and Greek. II. The literature is of small extent. 1. *The Samaritan Targum*, ascribed to Nathanael the high-priest, who died B.C. 20, and probably written about the same time as the Targum of Onkelos, which it somewhat resembles. The translation is close and literal. It is printed in the Paris and Walton polyglots, and in several recent German editions. 2. *Chronicles*: (1) *The Samaritan chronicle*, or book of Joshua, ascribed by critics to the 13th c., taken in part from the canonical book of Joshua, with legendary additions, that charge the Jews with being oppressors of the Samaritans, and, after the time of Eli, apostates from the faith. The narrative is continued to 350 A.D., when it abruptly ends. (2) The chronicle of "the generations"—professedly written by Eleazar ben Amram, 1142, and afterward continued by many hands—gives a calculation of sacred times, the age of patriarchs, and a list of high-priests. (3) The chronicle of Abulfath, written about the middle of the 14th c., is drawn from the two previous works, with additional legendary matter. 3. *Liturgies and hymns* belonging to different periods, the earliest being ascribed to the angels. There are 19 vols. of them in the British museum, besides collections in other places. 4. *Commentaries, theological tracts, and recent grammatical works*, written in Arabic.

SAMARRAH, a t. in s.e. Asiatic Turkey, on the e. bank of the river Tigris, 70 m. n.n.w. of Bagdad. It is a walled town, and among the objects of interest are two Mohammedan tombs surmounted by cupolas, visited by multitudes of votaries of the

Sheeah sect. It contains a spiral tower, the ruins of a college, a palace, and the Median wall.

SÂMAVEDA is the name of one of the four Vedas. See **VEDA**.

SAMBALPUR, a district in e. central British India; drained by the Mahanadi and smaller rivers; 4,521 sq. m.; pop. '91, 796,000. The aboriginal people are of the Ghond and Dhangar tribes. The rajahs of the district were maintained in power against the Mahrattas until 1849, when the country came under British rule. Chief city, Sambalpur.

SAMBALPUR, a t. of British India, capital of the district of the same name, on the left bank of the Mahanadi, 140 m. w.n.w. of Cuttack. The town contains the ruin of an old fort. Pop. about 14,000.

SAMBAS. See **PONTIANAK**.

SAMBOURNE, EDWARD LINLEY, caricaturist and humorous artist, was born Jan. 4, 1845, and educated at the City of London school and at the College, Chester. He was intended for the engineering profession, but being introduced in 1867 to Mark Lemon, published his first drawing in *Punch*, April 27, 1867, and has since then devoted himself to the art of illustration. His principal works, beside his drawings for *Punch*, by which he is best known, are the illustrations to *New History of Sandford and Merton*, by F. C. Burnand, 1872; *Military Men I Have Met*, by Capt. Fenton, 1872; *Our Autumn Holiday on French Rivers*, by Arthur à Beckett, 1874; *Modern Venice*, 1877; Kingsley's *Water Babies*, 1885; Andersen's *Fairy Tales*, and the Diploma for the International Fisheries Exhibition, 1883, exhibited at the Royal Academy, 1885.

SAMBUCUS. See **ELDER**.

SAMNITES, an ancient Italian people of Sabine origin, who occupied an extensive and mountainous region in the interior of southern Italy. They were surrounded on the n. by the Peligni, Marsi, and Marrucini; on the w. and s.w. by the Latins, Volscians, Sidicini, and Campanians; on the s. by the Lucanians; and on the e. by the Apulians and Frentani. The Samnites were divided into four nations: 1. The *Caraceni* in the n., whose capital was Aufidena. 2. The *Pentri* in the center, whose capital was Bovianum, and who constituted the most powerful nation of the Samnite stock. 3. The *Caudini*, in the s.w. 4. The *Hirpini* in the s., whose capital was Beneventum. For an account of their origin, ethnological affinities, and history, see **ROME**.

SAMO'AN ISLANDS. See **NAVIGATORS' ISLANDS**.

SAMOS (Mod. Gr. *Samo*; Turk. *Susam Adassi*), an island in the Ægean sea, is situated about a m. off the coast of Asia Minor, in the bay of Scalanova, about 45 m. w. of Smyrna. Its length is 30 m.; its mean breadth about 8 miles. A range of mountains, which may be regarded as an insular continuation of mount Mycale, on the mainland, runs through the whole island, whence its name—Samos, being an old Greek word for any height in the neighborhood of the sea. The highest peak, mount Kerkis (anc. *Cercteus*), reaches an elevation of 4,725 feet. Samos is still, as in ancient times, well wooded. Between its eastern extremity and the mainland lies the narrow channel of Mycale (called by the Turks the *Little Boghaz*), where, in 479 B.C., the Persians were totally defeated by the Greeks under the Spartan Leotychides. Between the island and Nicaria (anc. *Icaria*), on the w. is the *Great Boghaz*, from 3 to 8 m. broad, and much frequented by vessels sailing from the Dardanelles to Syria and Egypt. Samos is well watered and very fertile, exporting considerable quantities of corn, grapes, wine, oil, valonia, etc.; its mountains furnish quarries of marble; also mines of zinc and lead; and iron ore, emery, loadstone, and ochre are to be found. Khora ("the town") is situated on the s. side of the island, at the base of the hill (about 2 m. from the sea), on which ruins of the ancient acropolis (*Astypalaia*) are still visible. On the n. coast lies Vathy or Bathy (the capital), which derives its name from its deep (Gr. *bathys*) harbor. The pop. of the island in '96 was 49,733.

Anciently, Samos was one of the most famous isles of the Ægean. At a very remote period, it was a powerful member of the Ionic confederacy, and (according to Thucydides) its inhabitants were the first, after the Corinthians, who turned their attention to naval affairs. Their energy and resources were soon seen in the numerous colonies which they established in Thrace, Cilicia, Crete, Italy, and Sicily. But the celebrity of the island reached its acme under Polycrates (q.v.) 532 B.C., in whose time it was mistress of the archipelago. Subsequently, it passed under the power of the Persians, became free again after the battle of Mycale, stood by Athens during the Peloponnesian war, and after several vicissitudes, became a portion of the Roman province of Asia, 84 B.C. Its later history is but the melancholy record of continuous decay, nor till the rise of the modern Greeks against the Turks did it ever again acquire distinction. When the war of independence broke out none were more ardent and devoted patriots than the Samians; and deep was their disappointment when, at the close of the sharp and brilliant struggle, European policy assigned them to their former masters. They are not, however, incorporated, so to speak, with the Turkish empire, but are semi-independent, being governed by a Fanariot Greek, who bears the title of prince of Samos, and pays tribute to the Porte.

SAMOTHRACE, or THRACIAN SAMOS (Mod. Gr. *Samothraki*), an island in the n. of the Ægean, n.e. of Lemnos (*Stalimene*). It belongs to Turkey. It is a rugged and

mountainous mass, about 18½ m. long by 8½ m. broad, towering to the height of 5,400 ft., and forming the loftiest land in the whole Greek archipelago. The traveler on the plains of Troy can see its white summit shining afar in the n.w. over the intervening hills of Imbros—a proof that Homer drew from personal observation when he made Poseidon watch from his Samothracian throne the events of the war. The island has not a single good port, whence Pliny calls it “the most harborless of all isles” (*impotuosissima omnium*), but there are some good anchorages. Its history is quite unimportant, and all the interest attaching to it is derived from its connection with the mysterious and gloomy worship of the Cabeiri (q.v.). Pop. '89, 2536, almost all Greeks.

SAMOYEDES, the name of a race widely spread over the extreme n. of Europe and Asia, and forming one of the four families of the great Altaian stock. Originally, the Samoyedes inhabited the whole of the vast Siberian plain from the Altai to the Arctic sea, but for many hundred years Mongolian peoples have forced themselves in among them. Their chief seat at present is the region lying between the Obi and the Yenisei. They have been very little influenced by Russian civilization or Christianity, retain in great measure their old manners and customs, and live by fishing, or the rearing of reindeer. The most important researches concerning their ethnographic and linguistic relations have been made by Castren (q.v.).

SAMP (North American Indian, *sāpac*, softened). A kind of food made from broken maize, sometimes called coarse hominy, boiled in water. See **HOMINY**.

SAMPHIRE *Crithmum*, a genus of plants of the natural order *umbelliferae*; having compound umbels, and an oblong fruit, rather flattened at the back, with five winged ridges, and many *vitæ* spread all over the seed. **COMMON SAMPHIRE** (*C. maritimum*) is a perennial, native of Europe, growing chiefly on rocky cliffs near the sea. It is common in the s. of England, but is rare in Scotland. Its radical leaves are triternate; those of the stem have lanceolate and fleshy leaflets. The stem is about 1½ ft. high, the flowers yellow. Samphire makes one of the best of pickles, and is also used in salads. It has a piquant, aromatic taste. It is generally gathered where it grows wild, but is sometimes very successfully cultivated in beds of sand, rich earth, and rubbish, occasionally supplied with a little salt.—*Inula Crithmoides*, a perennial plant, allied to elecampane (q.v.), and of the natural order *compositæ*, a native of the sea-coasts of England, is used in the same way as samphire, and is often called **GOLDEN SAMPHIRE**.

SAMPSON, a co. in s.e. North Carolina, bounded by South river on the w., and drained by Black river and its affluents; 966 sq.m.; pop. '90, 25,096. The surface is undulating, covered with large forests of pitch-pine. The soil is sandy; the main productions are corn, cotton, sweet potatoes, tobacco, rice, honey, wool, sheep, and swine. Co. seat, Clinton.

SAMPSON, DEBORAH, 1760–1827; b. Plympton, Mass.; shouldered a musket in the revolutionary war, and joined the 4th Mass. regiment with the pseudonym of Robert Shurtleff. She fought at Tarrytown, was wounded; took the field again at Yorktown; and when the war was over retired with a pension, and married Benjamin Gannett. Her residence from that time was a farm in Sharon, Mass. She published 1797, *The Female Review*, new edition 1866.

SAMPSON, EZRA, 1749–1823; b. Mass.; graduated at Yale college, 1773; settled at Plympton, Mass., 1775, and chaplain in the army at Cambridge in the first revolutionary campaign, 1775–76; settled at Hudson, N. Y., in 1797; associated, 1801–4, with the Rev. Harry Crosswell in the editorship of the *Balance*; editor in 1804 of the *Hartford Courant*; judge of the Columbia co. court in 1814. He published *Beauties of the Bible*; *The Sham Patriot Unmasked*; *The Brief Remarker*; *The Historical Dictionary*, often republished.

SAMSOE, a small island belonging to the kingdom of Denmark, is situated in the northern entrance to the Great Belt, between Zealand and Jutland. Area, 69 sq. m.; pop. '90, 6475. The inhabitants are chiefly engaged in agriculture.

SAMSON (Heb. *Shimshon*, compare *Shemesh*, sun), the son of Manoah, of the tribe of Dan, for 20 years “judge” over the south-western tribes of Israel—perhaps only of Dan. It would appear, however, as if this title had only been bestowed upon him as a kind of reward for his daring and extraordinary exploits against the neighboring Philistines, who at his birth held a great part of Palestine tributary. There is in the whole account of his deeds no sign of any superior authority vested in him. His history bears altogether more the general character of a popular tale, or saga, than that of a real historical account. His whole life is surrounded by a marvelous halo from his birth to his death. To his mother, long barren (cf. Gen. xviii. 10, 1 Sam. i. 2, etc., Luke i. 7, etc.), there appeared an angel, who promised her a son on the condition that he should become a Nazarite. He is born: his mother abstaining from all strong drink and unclean food before his birth. His hair, left to grow to its full length, in accordance with the Nazarite rules, endows him with a supernatural strength, which apparently increases with each manifestation. His first feat is his tearing a lion, when on his way to ask a Philistine woman in marriage. Returning the same road, to celebrate his wedding, he finds a swarm of bees in the lion's carcass, and forthwith propounds a riddle, which, through his wife's treachery, costs 30 Philistines their lives. We need not here recapitulate the

many similar exploits composing his well-known career, which he ended by pulling down the house upon himself and his enemies the Philistines, so that "the dead which he slew at his death were more than they which he slew in his life."

It has been matter of most contradictory speculations, how far his existence is to be taken as a reality, or, in other words, what substratum of historical truth there may be in this supposed circle of popular legends, artistically rounded off, in the four chapters of Judges (xiii.-xvi.) which treat of him. To begin with, difficulties are raised respecting the time in which he is said to have lived. While some hold him to be a contemporary of Eli and Samuel, others see in Eli his successor; others again suppose an interregnum between him and Eli. Next comes the question how he, a Nazarite, could eat honey out of the lion's carcass—a fact, by the way, entirely ignored by Josephus. The miraculous deeds he performed have taxed the ingenuity of many commentators, and the text has been twisted and turned in all directions, to explain "rationally" his slaying those prodigious numbers single-handed; his carrying the gates of Gaza, in one night, a distance of about 50 m., the probable distance from Hebron to Gaza, and some have indeed assumed that he did not carry them there all at once, but piecemeal. But the principal difficulty seemed to lie in the well that sprang out of the jaw-bone, and the early Jewish interpreters (Targum, Josephus) take the word *Lehi* to be the name of a place; a notion countenanced, so far, by Gesenius, as he allows that it might have been "derived etymologically from this myth."

The close parallel between the deeds of Samson and those of Hercules has caused some to identify the two heroes; yet whose might be the priority, is matter of contest between the different schools of biblical criticism. It is not necessary to enlarge upon this point. It is well known how Hercules slays the Nemean lion; another formidable lion at the mount of Cithæron; how he catches the stag of Diana and the Cretan bull; how he is kept prisoner in Egypt; how he comes to his death by the agency of a woman; not to mention the extraordinary circumstances of his birth, and the like. See *HERCULES*. This once popular notion, however, of seeing nothing more in Samson than the Tyrian sun-god Hercules (Baal-Shemesh, "Lord of the Sun;" Baal-Chamon, "Lord of the Heat," etc.), and the attempt to explain the various "myths" accordingly, is not countenanced by most modern critics. However embellished and overlaid with legends, they say, the account in the Book of Judges may be, there is hardly any doubt as to the real existence of a man Samson, of extraordinary prowess, who turned his whole might and strength against the hereditary enemies of his people, whose land bordered on that of the tribe to which he belonged; who, with all his blemishes, was possessed by a noble, self-sacrificing patriotism, and never for one moment forgot the chief end and aim of his life, viz., to free his people from foreign yoke. Altogether, he is too human ever to have been an allegory or a parable, the moral of which would, indeed, hardly be perceptible, or to have, as some have conjectured, "been intended through his whole career to be a living mockery of the Philistine Hercules."

SAMSON, GEORGE WHITEFIELD, D.D., b. Mass., 1819; graduated at Brown university in 1839, and Newton theological institution in 1843: was pastor of a Baptist church in Washington, 1843-49. In 1847 he traveled in southern Europe, Palestine, and Syria. In 1858 he was elected president of Columbian college, Washington; in 1871 became president of Rutgers college for girls, New York; resigned in 1875, and became pastor of a Baptist church in that city. In 1848 he published letters on Egypt, Palestine, and Italy, and articles on Mount Sinai, Goshen, etc.; in 1852, *To Dæmonion*, which in 1860 was enlarged and republished under the title *Spiritualism Tested; Outlines of the History of Ethics*, etc., and d. in 1896.

SAMSON, JOSEPH ISIDORE, 1793-1871; b. France; became an amateur actor, and in 1812 began to study in the conservatory. He soon gained success, and in 1827 was elected to the *Théâtre Français*. He was many years professor of elocution at the conservatory. Samson wrote a number of dramas and farces, and a poem, *L'Art Théâtral*.

SAMUEL (Heb. *Shemuel*, heard by or asked from God), the last *shofet* or judge of Israel, the "first of prophets," the founder of the schools of prophets and of the monarchy in Israel. He was the son of Elkanah and Hannah, a woman of no ordinary gifts, and almost a Nazarite herself, who dedicated the long yearned-for child to the Lord even before his birth. Elkanah was of Levitic descent, living, however, not among his own tribe, but in Ephraim. Samuel, brought up in the sanctuary at Shiloh, under the eyes of Eli, there received his first prophetic call, and from that time forth, his prophetic mission was decided. For about twenty years from the death of Eli and his sons, we hear nothing of Samuel. The first public manifestation of his assumption of the office of judge is his convoking an assembly at Mizpeh, and routing, at the head of the people, the Philistines—his first and probably his only military achievement. His occupations generally were of a more peaceful character. Dwelling in his own native city of Ramah, where he had erected an altar, he annually went "on circuit" to the three principal sanctuaries w. of the Jordan, Bethel, Gilgal, and Mizpeh, there to instruct and judge the people, and break them from their idolatrous habits, to which they were wont to yield, in imitation of the peoples around them. For the better carrying out of this purpose, he organized special schools of teachers and prophets. These seem to have formed special colonies (Naboth, Bethel, Gilgal, Jericho), and to have moved about

in large numbers. These fraternities were destined to take an important place in the commonwealth, and to exercise the greatest possible influence upon the internal as well as the external affairs of the state, while at the same time they were the teachers of the people, expounding and developing the Mosaic law, and keeping the sacred traditions alive within the houses and hearts of Israel.

The peace Samuel had restored—for during his lifetime those harassing raids from the neighboring tribes had entirely ceased—and the happy use he made of it by consolidating the religious institutions and the internal power and union of the people, must have impressed the latter with the advantage of being ruled by a firm and capable head and hand. It would have been easy enough for Samuel to have got himself elected king of Israel, but the establishment of a dynasty appeared to him utterly contrary to the theocratic character of the law. When, however, his two sons, Joel and Abiah, whom he had installed provisional or supplementary judges, “turned aside after lucre, and perverted judgment,” and the complaints of the people were loud about them, Samuel was pressed by its representatives, who foresaw a time of terrible anarchy and lawlessness at his approaching demise, and he was obliged to yield to the general wish of installing a king to judge them “like all the nations.” See **Jews** and **SAUL**. The further events of Samuel’s life, as connected with Saul, and subsequently with David, are well known, and will be found indicated briefly under those two heads. As to his character, notwithstanding the reproaches that have been heaped upon him, we cannot but see in him one of the wisest, most sagacious, unselfish, patriotic heroes. He was, doubtless, severe and energetic in the extreme, following the path that seemed to him indicated by Jehovah as the only one leading to the common welfare. Gifted with both the spiritual and worldly supreme power over the people, at a time when they had neither political unity, nor laws, nor a *cultus*, he succeeded in rousing the public spirit, in uniting all the tribes under one banner, and in shaking off the Philistine yoke. He routed idolatry, and raised, by the institution of prophetic schools, the Mosaic religion to the highest eminence, while they at the same time formed a healthy counterpoise to priestcraft. That on finding Saul negligent to certain dicta of the law, for the protection of which alone he had been elected, he casts aside all personal love and fear, and for the sake of saving the country, and keeping its constitutions intact, chooses another more worthy head for the commonwealth, is not more than could be expected from this most zealous champion for Jehovah’s commands. The people themselves gave him the most honorable testimony for his uprightness and justice, and later ages place him side by side with Moses.

Samuel seems, after having anointed David, to have retired from public action, and to have lived in comparative seclusion at Ramah—there is, at least, no further mention of him until his death. The time of his life and the period of his judgeship are not given. It may be presumed that he died not long before Saul. If the latter ruled for twenty years, it may well be that they governed together, as Josephus has it (*Ant.* vi. 14, 9), for eighteen years; his age, however, is not easily calculated, and the opinions about it vary between sixty and ninety years. He was buried at Ramah, and his tomb is still shown at Nebi Samwil, although, according to Jerome, his remains were removed, under the emperor Arcadius, to Thrace. All Israel mourned him as they had mourned none since Moses. For his apparition at En-Dor, etc., see **NECROMANCY**.

SAMUEL (**SIEMUEL**), **BOOKS** OF, originally formed one work, but were by the LXX. and Vulg. (followed by the recent Hebrew editions since Bomberg) and the authorized version, divided into two books, the first closing with the death of Saul. The name they bear is derived from Samuel, as the principal figure in them. He not only stood at the head of the commonwealth at the period they treat of in a spiritual and worldly capacity, but also anointed Saul and David, and exercised an important influence upon their rule. Their contents beginning with the high-priesthood of Eli, the narrative concludes with the death of David, and thus three principal periods are noticeable—1. The restoration of the theocracy, of which Samuel assumes the leadership (I. i.—xii.); 2. The history of Saul’s kingship till his death (I. xiii.—xxxi.); and 3. David’s reign (II.).

The plan of the whole work is not, as has been stated, to represent one king as he ought not to be—viz., Saul, contrasted by a king after the heart of God, David; but simply to draw the development of the theocracy from the end of the period of judges to the end of David’s reign, its humiliation and its glory under Samuel and David, whose history is, to a certain extent, told with biographical minuteness, on account of their being the divinely-chosen vessels for this great work of the restoration. As to the composition and unity of the books, it has been the prevailing opinion of scholars to see in them not a loose compilation from a number of stray sources, but a consecutive narrative drawn upon ancient and authentic documents. The character of the narrative itself, occasionally dwelling at large upon biographical episodes, occasionally assuming the brevity of a mere chronicle, and at times repeating itself at length, is quite in accordance with ancient Semitic historiography. It has been supposed by some that the books of Samuel were composed by the same hand that wrote the books of Kings, but they belong to a much earlier period. The author appears to have lived after the separation of the kingdoms, but long before the Exile, the language being remarkably pure, and quite free from late forms and Chaldaisms. In all probability, the author was a

tion of the kingdoms, but long before the Exile, the language being remarkably pure, and quite free from late forms and Chaldaisms. In all probability the author was a prophet of the time of Solomon. The Talmudical notion of Samuel's authorship has been rejected by the critics, as inconsistent with the contents and circumstances of the book. There are glosses in the book due to later hands. Of sources, we only find the "Book of Jashar" mentioned in the work. The author, if he did not use real annals of the empire, which were only first commenced under Solomon, had, at all events, a certain number of prophetic narratives of Samuel's, Saul's, and David's lives and doings before him. As regards the occasional verbal agreement between Samuel and Chronicles, which has often been commented upon, we may either assume that the latter drew upon the former, or that they both—which is more probable from internal evidence—drew upon the same source, and modified their accounts according to their special tendencies. Altogether, the work before us bears the character of a truly authentic record. Of modern commentators, we mention principally Hensler, Königsfeldt, Thenius, and Ewald.

SAMYDA'CEÆ, a natural order of exogenous plants, which are all trees or shrubs and all tropical, mostly American. The order contains about 80 known species, generally characterized by astringency in the bark and leaves. Some are used in medicine to make poultices for wounds, lotions for ulcers, etc. The foliage of *casearia sculenta* is eatable.

SANĀĀ', city in Arabia, capital of Yemen, is situated in a deep and beautiful valley, about 20 or 30 m. in length, and 6 or 7 in breadth, and is 7120 ft. above the level of the sea. The population of the city has been estimated at 30-35,000, of which 3500 are Jews. This valley is bounded on the e. by a high range of mountains called Jebel Nikkum and is studded throughout its length with large villages. The climate is healthy and the air very dry, for rain seldom falls. Most of the water is supplied from wells. There is a flourishing trade in aloes, skins, coffee, indigo, and gum arabic. There are manufactures of carpets.

The city and its suburbs are both surrounded by high walls, and, including the gardens, the circumference is about four and a half miles. The houses are of brick, well and strongly built, and most of them furnished with fountains, while the palaces of the Imāms almost approached magnificence. The Jews have a quarter to themselves, distant about half an hour's walk from the Mohammedan town; it contains many buildings, once the abode of affluence and ease, but now bearing unmistakable signs of the devastation committed by the savage and fanatical Mohammedans of the city. The city walls are of unburned brick, and mounted with cannon, but they are in a very bad condition. There are four gates, and at both e. and w. end a castle containing a palace built in the Saracenic style with extensive gardens round them, and constructed with a view to defense, but now utterly neglected. See **YEMEN**.

SAN ANTONIO, city and co. seat of Bexar co., Tex.; on the San Antonio and San Pedro rivers and the International and Great Northern, the San Antonio and Aransas Pass, the San Antonio and Gulf Shore, and the Southern Pacific railroads; 75 miles s.w. of Austin. Its history dates back to 1714 when the Spanish built Fort San Fernando on the right bank of the San Pedro. Here also was established in 1718 the mission of the Alamo, but later both were removed to the other side where the settlement of San Antonio de Bexar or Bexar sprang up, which was the capital of Texas during Spanish and Mexican rule. The massacre of the Alamo (q. v.) in 1836, and the surrender by General Twiggs of the United States forces in 1861 are later important events. San Antonio was incorporated as a city in 1873. The older portion has been largely rebuilt since 1860, and a quaint and sleepy place transformed into one of the great business centres of Texas. There are large stock yards, car shops, flour mills, breweries, tanneries, ice factories, etc., and an extensive trade in cotton, lumber, live stock, hides, wool, and pea-nuts. There are three principal quarters: the city proper, with three large plazas, the Alamo and other historic buildings; Chihuahua, occupied by Mexicans who occupy low wooden and stone houses; and Alamo, the German quarter, situated on higher ground and containing many handsome buildings. The city is the seat of Protestant Episcopal and Roman Catholic bishops, the headquarters of the U. S. military department of Texas, and the site of a U. S. military reservation of 200 acres. It contains over 40 churches, including the Roman Catholic cathedral of San Fernando, and the handsome Protestant Episcopal church of St. Marks; high school, St. Mary's college (R. C.), Ursuline academy, West Texas military academy, San Antonio academy, collegiate institute, and St. Louis college (R. C.), founded in 1894: several national, state, and private banks; electric light and street railroad plants; U. S. government building, co. court-house that cost nearly \$1,000,000, and several hospitals. Pop. '90, 37,673.

SAN ANTONIO, the name of three capes. The first is in the Argentine Republic, at the mouth of the Rio de la Plata; the second on the east coast of Spain, opening into the Mediterranean; and the third on the western coast of Cuba.

SAN AUGUSTINE', a co. in e. Texas, drained by Angelina river and Attoyac bayou and their branches; 560 sq. m.; pop. '92, 6688, chiefly of American birth, inclu. colored.

The surface is level and the soil good. Cotton, corn, sweet potatoes, and pork are the staples. Co. seat, San Augustine.

SAN BENEDETTO PO, a t. in N. Italy, on the s. bank of the Po, in the province of Mantua, 12 m. s.e. of the city of that name; pop. 10,319. It is built along the left bank of the Lirone, and has a fine church of the Benedictine order, and a monastery founded in 1004, celebrated as the abbey of San Benedetto di Po, but now appropriated to other than spiritual uses.

SAN BENITO, a co. in w. California, lying on the e. slope of the Coast Range mountains; drained by the San Benito river; traversed by the Southern Pacific railroad; pop. '90, 6412, chiefly of American birth. This county was formed in 1874 from the e. part of Monterey. The principal industry is stock-raising. Co. seat, Hollister.

SAN BERNARDINO, a co. in s.e. California, adjoining Nevada on the n.e. and Arizona on the e.; drained by the Amargoza, Santa Ana, and Colorado rivers; about 21,000 sq. m.; pop. '90, 25,497, chiefly of American birth. The greater part of the surface is arid and mountainous. Many hot springs are found. In the s.w. are fertile valleys, of fine climate and fertile soil, where there are extensive vineyards; wheat, barley, corn, oats, and wine are the staples. In the mountains gold is found, and in the s.w. gold, silver, copper, tin, marble, and alabaster. Co. seat, San Bernardino.

SAN BERNARDINO, city and co. seat of San Bernardino co., Cal.; on the Santa Ana river and the Atchison, Topeka, and Santa Fé and the Southern Pacific railroads; 60 miles e. of Los Angeles. It contains a co. hospital, high school, public library, courthouse that cost \$350,000, electric light plant, waterworks supplied from artesian wells, railroad machine shops, soap and cigar factories, and national and state banks. The principal industries are agriculture, horticulture, and mining. Pop. '90, 4012.

SANBORN, FRANKLIN BENJAMIN, b. Concord, N. H., 1831; lecturer and contributor to periodical literature; long in editorial connection with the *Springfield Republican*; author of *Thoreau*, in the *American Men of Letters* series; *Life and Letters of John Brown* (1885); *Familiar Letters of H. D. Thoreau* (1894), etc. He was in the group of radical opposers of slavery, before the war.

SANBORN, KATHARINE ABBOTT, author, was born in Hanover, N. H., in 1839, became a teacher, and was for several years previous to 1886 a professor of English literature at Smith college; lectured on literature and education and has been a newspaper correspondent. She has published *Home Pictures of English Poets* (1869); *The Vanity and Insanity of Genius* (1885); *Wit of Women* (1886); *A Year of Sunshine* (1887).

SAN CATALDO, a commune in w. Sicily, in the Val di Mazzara, 4 m. s.w. of Caltanissetta, having valuable sulphur mines; pop. '81, 15,105.

SANCHUNIA THON (SANCHONIATHON, SOUNIATHON), the supposed author of a Phœnician history of Phœnicia and Egypt, called *Phœnikika*. He is supposed to have been a native of Berytus; and the accounts which speak of him as born at Sidon or Tyre probably take these cities in their wider sense for Phœnicia itself. Our principal information about him is derived from Philo of Byblus, a Greek writer of the beginning of the 2d c. A.D., who translated Sanchuniathon's history into his own tongue; but both the original and the translation are lost save a few small portions of the latter, preserved by Eusebius, who uses them as arguments in a theological dispute against Porphyry. According to Philo, Sanchuniathon lived during the reign of Semiramis, queen of Assyria, and dedicated his book to Abibalus, king of Berytus. Athenæus, Porphyry, and Suidas, on the other hand, speak of him as of an ancient Phœnician, who lived "before the Trojan war." There is also a discrepancy between the various ancient writers respecting the number of books contained in the *Phœnikika*. Orelli (1826), and after him C. Müller (1849), published the remaining fragments of Sanchuniathon, and the hot discussion raised on their genuineness and value is far from being settled yet. Several critics went so far as to deny the fact of the existence of a Sanchuniathon point blank. According to some (Lobeck, etc.), it was Eusebius; according to others (Movers, etc.), Philo, who fathered his own speculations upon an ancient authority. The latter was actuated, Movers thinks, partly by the desire of proving that the whole Hellenistic worship and religion was simply a faint imitation of the Phœnician; partly by the desire of lowering the value of the Old Testament, by showing the higher authority of the Phœnician writer; and partly, as was the fashion among the unbelieving philosophers of his age, to bring the popular creed into a bad reputation, by proclaiming his own views under the guise of an ancient sage. Yet even those who deny the authenticity of Sanchuniathon agree in allowing the fragments current under his name a certain intrinsic value, they being founded on real ancient myths. This, in fact, is now, with more or less modification on the part of the different investigators, Ewald, Bunsen, Renan, etc., the prevalent opinion. Ewald contends for the real existence of a Sanchuniathon, in which he is supported by Renan. Even if there never was a Sanchuniathon, it was not Philo who forged him. There seems no doubt that we have but a very dim and confused reproduction of what, after many modifications, misunderstandings, and corruptions, finally passed the hands of Philo and Eusebius, and was by the church father, as we said, quoted in a theological disputation.

The *Phœnikika* was not only a cosmogony, it would appear, but a history of his and

the surrounding nations; and like similar ancient histories, it probably began with the creation of the world, and contained an account of the Jews. All the historical parts, however, are lost, and nothing remains but a fragmentary cosmogony, or rather two or three different systems of cosmogony, or, according to Movers, merely an Egyptian and Phenician patchwork, for a brief account of which we refer the reader to the article PHENICIA. One of the chief difficulties for us consists in the Phenician words of Sanchuniathon, which Philo either translated too freely, or merely transcribed so faultily in Greek characters as to render them an everlasting puzzle.

Eusebius further contains a fragment of a treatise by Sanchuniathon, *Peri Judaion*, but it is doubtful whether this is the work of Philo of Babylon or of Sanchuniathon; and if it be that of the latter, whether it is a separate work, or merely a separate chapter out of his larger work. A forgery, said to contain the whole nine books of Sanchuniathon, and to have been found by a Portuguese, col. Pereira, at the convent of St. Maria de Merinhão, and to have been by him intrusted to a German corporal in Portuguese service, named Christoph Meyer, was published by Wagenfield (Bremen, 1837), and translated into German (Lübeck, 1837), but was very soon consigned to disgrace and oblivion by Movers, K. O. Müller, and Grotefend, the last of whom had at first not only believed in its genuineness, but even written a preface to the *editio princeps*. There never was such a convent or such a col.; but the fac-simile taken by "Pereira" in the convent in Portugal was found to have been written on paper showing the water-marks of an Osnabrück paper-mill.

SAN CRISTOBAL, a city in Mexico, capital of the state of Chiapa, 485 m. e.s.e. of Mexico; pop. about 16,050. It is in a fertile and well-cultivated valley. The seat of a Bishop of Chiapas. Its chief manufactures are cotton, sugar-cane and spices. It has a cathedral, hospital, convent and high school. The town was founded in 1528 by the name of Villa Real, afterward called San Cristobal de los Llanos, and Ciudad Real. Its present name was given in 1829.

SANCROFT, Dr. WILLIAM, an English archbishop, historically notable as the most distinguished dignitary among the *nonjurors* (q.v.), was b. at Fresingfield in Suffolk, Jan. 30, 1616, educated at the grammar school of Bury St. Edmunds, and at Emanuel college, Cambridge. Sancroft was reckoned a first-rate scholar by his contemporaries, and in 1642 Sancroft was elected fellow of his college, but in the following year he was deprived of his fellowship by the Puritans for refusing the famous "engagement," after which he went abroad. On the restoration of Charles II., in 1660, he was appointed chaplain to Cosin, bishop of Durham; and, after several preferments, was in 1668 made arch-deacon of Canterbury, and in 1677 was raised, against his inclination, to the first dignity in the church—the archbishopric of Canterbury. The manner in which Sancroft discharged his ecclesiastical duties deserves the highest commendation. He attended king Charles II. on his death-bed, and is said to have spoken very freely to the once "merry monarch" on the nature of his past life. In 1688, along with several of his brother-bishops, he was committed to the tower by king James II., for sending him a petition in which they explained why they could not conscientiously order his declaration in favor of liberty of conscience to be read in the churches; but in the events which immediately preceded and accompanied the great revolution, he played a somewhat ambiguous and perplexing part. At first he refused when James asked him to sign a declaration expressing abhorrence of the prince of Orange's invasion. Later (Dec., 1688), he even went the length of concurring in an address to William, yet he seems from this point to have drawn back, and to have fallen under the dominion of his theory of the divine right of kings. He was not present at the convention of the lords spiritual and temporal to meet the new monarch, and after the settlement, he refused along with seven other bishops, to take the oath of allegiance to the government, in consequence of which he was suspended by act of parliament, Aug. 1, 1689, but his actual departure from Lambeth did not take place till June 23, 1691. He then retired to his native village, where he died, Nov. 24, 1693. See Macaulay's *History of England*, vols. ii. iii. and iv.

SANCTIFICATION, in distinction from justification, in the nomenclature of Protestant theology, is the process by which the Holy Spirit renews man in the divine image, destroying within him the power of evil, and quickening, educating, and strengthening in him the life of goodness and holiness. Whereas justification is considered as a judicial act on the part of God's free grace, liberating the sinner from condemnation, absolving and pardoning him once for all, sanctification is reckoned a work or process, advancing in various stages of weakness or strength, and only completed in the future life of the believer, when removed beyond the influences of sin that now surround him. In Roman Catholic theology, this distinction between the initiative of the divine life in man (justification) and its progressive development (sanctification) is not maintained, at least in the same precise and logical manner that it has been advocated by Protestants. By the latter the distinction has been held of first rate importance in their theological systems, and no less so in their practical conception of the Christian life.

SANCTUARY, a consecrated place which gives protection to a criminal taking refuge there; or the privilege of taking refuge in such a consecrated place. Among the Jews there were cities of refuge to which the slayer might flee who killed a man una-

wares, and something analogous to a right of sanctuary may also be traced in pagan communities. In the ancient Greek states the temples, or at least some of them, afforded protection to criminals, whom it was unlawful to drag from them, although the food which was being supplied might be intercepted. As early as the 7th c. the protection of sanctuary was afforded to persons fleeing to a church or certain boundaries surrounding it. The canon and more ancient ecclesiastical law recognizes this protection to criminals as continuing for a limited period, sufficient to admit of a composition for the offense; or, at all events, to give time for the first heat of resentment to pass, before the injured party could seek redress. In several English churches there was a stone seat beside the altar where those fleeing to the peace of the church were held to be guarded by all its sanctity. One of these still remains at Beverley, and another at Hexham. To violate the protection of this seat, or of the shrine of relics, was an offense too grave to be compensated by a pecuniary penalty. Connected, in England, with the privilege of sanctuary was the practice of *abjuration of the realm*. By the ancient common law, if a person guilty of felony took the benefit of sanctuary, he might, within forty days afterwards, go clothed in sackcloth before the coroner, confess his guilt, and take an oath to quit the realm, and not return without the king's license. On confessing and taking the oath, he became attainted of the felony, but had forty days allowed him to prepare for his departure, and a port assigned him for embarkation, to which he must immediately repair with a cross in his hand, and embark with all convenient speed. If he failed to depart, or afterward returned without license, he was condemned to be hanged, unless he happened to be a clerk, in which case he was allowed the *benefit of clergy*.

By the ancient canons of the Scottish councils, excommunication was incurred by the offense of open taking of thieves out of the protection of the church. Some churches, however, by their superior sanctity, were held practically to afford a much surer asylum than others, and it was not uncommon for the Scottish kings, with the view of strengthening the hands of the church, to give a formal sanction to particular ecclesiastical asylums. One of the most celebrated sanctuaries in Scotland was the church of Wedale, now called Stow, where was an image of the Virgin believed to be brought by king Arthur from Jerusalem. David I. granted the "king's peace," in addition to the protection of the church, to all fugitives from peril of life or limb who betook themselves to the church of Lesmahagow. The Scotch law of sanctuary or *gryth* was, however, guarded from affording too easy an immunity.

A very remarkable right of sanctuary existed in Scotland under the name of the *privilege of Clan Macduff*, which was alleged to have been granted by Malcolm Canmore on recovering the throne of his ancestors. Any person related within the ninth degree to the chief of Clan Macduff, who should have committed homicide without premeditation, was entitled, on fleeing to Macduff's cross in Fife, to have his punishment remitted for a fine, or at least to be repledged from any other jurisdiction by the earl of Fife. There is evidence of this privilege having saved Hugh de Arbutnot and his accomplices from being proceeded against for the murder of John de Melvil of Glenbervie in 1421.

While the institution of sanctuary often enabled criminals to bid defiance to the civil power, it no doubt was not unfrequently a protection to the innocent, who thus escaped oppression or private enmity pursuing them under the name of law. In rude and unsettled times it seems, on the whole, to have operated beneficially by throwing the control of society into the hands of the clergy, who were less tempted than any other class to misuse that power. But as the civil power and authority of the law were strengthened the right of sanctuary became useless and mischievous; the civil power endeavored to narrow the privilege as far as possible, while the church sought hard to preserve it. The English reformation, though it greatly restricted, did not abolish the right of sanctuary. It was not till 1534 that persons accused of treason were debarred the privilege, and the right of sanctuary for crime was finally abolished by 21 Jac. I. c. 28. Various precincts, however, in and about London, known as sanctuaries, continued to afford shelter to debtors, all which were done away with in 1697, by act 8 and 9 Will. IV. c. 26.

In Scotland there still exists a sanctuary for debtors in the abbey and palace of Holyrood, with its precincts, including the hill of Arthur Seat and the Queen's Park.

SANCTUS, the division of the mass which follows the consecration of the host. The Plain Chant music, to which it was at first sung, was grave and simple. The Polyphonic composers usually set it to a real fugue of sacred character, but modern composers treat it in an infinite variety of methods. Bach makes a great effect in the Sanctus of his Magnificat by passages of sustained chords, and this number in Beethoven's Mass in D is especially majestic and reverent.

SAND, GEORGE. See DUDEVANT, MADAME.

SAND, KARL LUDWIG, 1795-1820, b. Germany; studied theology at the universities of Tübingen and Erlangen, and in 1817 joined the Teutonic society of Jena, a precursor of the *Burschenschaft*. He became a political fanatic on the subject of liberty, and considered it his mission to kill Kotzebue, as he regarded him as a spy of the Russian court. He entered the residence of Kotzebue in Manheim, March 23, 1819, and murdered him with a dagger. He then attempted to kill himself, but the wound did not prove mortal.

He was condemned to death April 17, 1820, which sentence was executed the following month.

SANDALS, a covering for the feet, consisting of soles so attached as to leave the upper part of the feet bare. See SHOES.

SANDAL-WOOD (a name corrupted from *santal* wood), the wood of several species of the genus *santalum*, of the natural order *santalaceæ* (q.v.), natives of the East Indies and tropical islands of the Pacific ocean. Sandal-wood is compact and fine grained, very suitable for making work-boxes and small ornamental articles, and is remarkable for its fragrance, which, however, is fatal to insects, so that cabinets of sandal-wood are extremely suitable for the preservation of specimens in natural history; but it is much too expensive for general use. The odor is due to an essential oil, heavier than water. **WHITE SANDAL-WOOD**, the most common kind, is the produce of a small tree (*santalum album*), a native of mountains in the south of India and the Indian Archipelago, much branched, resembling myrtle in its foliage and privet in its flowers. The trunk is seldom more than a foot in diameter. **YELLOW SANDAL-WOOD** is probably produced by another species, perhaps *S. Freycinetianum* of the Indian archipelago and Sandwich islands, and from these regions the Chinese import it, chiefly for the purpose of burning it both in their temples and in their houses. They reduce it to saw-dust and mix it with paste before burning. Dr. Seemann has, however, recently found another and previously-unknown species of *santalum* (*S. Yasi*) to yield the much-valued sandal-wood of the Fiji islands, where the tree has been almost extirpated in consequence of the demand for its wood in commerce.

RED SANDAL-WOOD, or **SANDERS**, is the produce of a very different tree, *pterocarpus santalinus*, of the natural order *leguminosæ*, suborder *papilionaceæ*, a native of the tropical parts of Asia, particularly of the mountains of the south of India and of Ceylon. The tree is about sixty feet high, with pinnated leaves, having generally three leaflets, and axillary racemes of flowers. The heart-wood is dark red, with black veins, and so heavy as to sink in water. It is used as a dye-stuff, and also by apothecaries to color certain preparations. The Arabs use it as an astringent, and it is the basis of some of our tooth-powders.—A deep red dye is also yielded by the chips of *adenanthera pavonina*, a tree allied to the *acacias* (q.v.), a native of the East Indies. The wood of this tree is sometimes called **RED SANDAL-WOOD**.

SANDALWOOD ISLAND, called by the natives Tjindana, Sumba, and Tanah Tjumba, lies in the Indian ocean, between 9° 18' to 10° 20' s. lat. and 118° 58' to 120° 43' e. long., has an area of 4,385 sq. m., and a pop. of 2,000,000. The coast is steep and rocky, so that, except at the w., s., and e. corners, ships can approach quite near. The produce consists chiefly in dye-woods, ebony, timber, cotton, rice, pepper, cocoa, maize, coffee, sugar, wild cinnamon, cocoa-nuts, and various fruits. Little sandalwood has been exported, though abounding in the forests, the natives having refused to cut the trees, which they believe to be the dwelling of their ancestors' souls. Exports are: horses, timber, cotton, pepper, and other spices, tow made from bark, maize, and edible nests. The cliffs swarm with the *collocalia esculenta*, and collecting the nests is a leading occupation of the men. The Sandalwood islanders belong to the Malay race, are well made, wiry, and of a brownish complexion. The most trifling causes have led them to commit suicide, a vice of rare occurrence in other parts of the archipelago.

The Sandalwood island is nominally subject to the Netherlands, but the rajahs and regents are almost independent of foreign influence. The principal havens are at Nangamessi on the n., and Tida about the middle of the s. coast, good anchorage being found in many other parts.

SANDARACH, or **SANDARACH RESIN**, is a friable, dry, almost transparent, tasteless, yellowish-white resin, which is imported from the north of Africa. It is completely soluble in oil of turpentine, but not completely soluble in alcohol. When heated, or sprinkled on burning coals, it emits an agreeable balsamic smell. It exudes from the bark of the sandarach tree (*Callitris quadrivalvis*), a native of the north of Africa, of the natural order *coniferae*.—The quantity of sandarach used is not great; it is employed mostly for the same purposes as mastic (q. v.). The finely-powdered resin is rubbed, as *pounce*, on the erasures of writing-paper, after which they may be written upon again without the ink spreading.—The wood of the sandarach tree is highly balsamic and odoriferous, extremely durable and valuable.

SANDAY or **SANDA ISLAND**, one of the most northern of the Orkney (q. v.) group. Area 11 sq. m.; contained, in 1891, 1929 inhabitants.

SANDBACH, a small parish and market t. of Cheshire, 4½ m. n.e. of Crewe by railway on an eminence on the right bank of the Wheelock. Pop. '91, 5824, mostly employed manufacturing salt, chemicals, boots, shoes, fustian, and iron articles.

SAND-BAGS, in military works, are canvas bags about 28 or 30 in. in length by from 14 to 16 broad. They are filled with sand or earth, and form a ready means of extemporizing a parapet or traverse against the enemy's fire; they are likewise used for protecting the head of a trench, or tamping the charge in a mine. See MINES, MILITARY. If employed as lining for embrasures or barbettes, sand-bags should be covered with raw hides to prevent them from taking fire.

SAND-BLAST is a method of engraving, cutting, and boring glass, stone, metal, or other hard substances, by the percussive force of a rapid stream of sharp sand driven against them by artificial means. The process was invented by gen. Benj. C. B. Tilghman, of Philadelphia, who took out a patent for it in Oct., 1870. In the world of nature the abrading power of sand when driven by air or water against hard substances has long been recognized, and gen. Tilghman's invention was merely an application of this principle to the mechanical arts. The means of propulsion may be supplied either by an air or a steam blast, the former being produced by a boiler at high pressure, and the latter by a fan revolving with great velocity. In either case the abrading material, which is usually common hard sand, although small granules of iron or crushed quartz are occasionally used, is directed by a tube upon the object to be cut or engraved, the latter being so adjusted by means of slides that each part in succession can be brought under the action of the cutting particles. The engraving of the surface of glass with ornamental figures, etc., may by this process be very easily accomplished simply by laying upon it patterns of the desired objects cut out of some resistant medium in the manner of stencils. The sand, of course, does not touch the protected parts, but indents those which are uncovered, until the result sought for is attained. Another method very commonly used is to cut the proposed pattern in sheet copper or brass, which is then placed over the glass, a brush of melted beeswax being drawn over the whole. The stencil is then raised, and the pattern left in exposed glass may then be operated upon by the blast. The ornamentation of glass in colors may also be performed by the sand-blast, for as the ordinary colored glass of commerce is mere window glass, with a thin layer of color on one side only, the use of the stenciled pattern as before will entirely remove the color from the exposed parts and leave it where protected. By the use of a photographed coating of gelatine upon glass (the well-known gelatine process in photography) very beautiful reproductions of line engravings may be made upon the glass at a small cost. The sand-blast is also without a rival in the cutting of ornaments and inscriptions upon stone. Iron stencils are sometimes used for the purpose, but the most satisfactory material is found to be sheet rubber of about 1-16th of an inch in thickness. This is cemented upon the stone and a movable jet pipe is caused to traverse the surface of the latter until the exposed portions have been sufficiently abraded. The wear upon the rubber itself is wonderfully slight and the same stencil may be used over and over again. Another use to which the sand-blast has been successfully put is in turning blocks of stone into circular and other forms in the lathe. Balcony pilasters, etc., have in this way been finished in a few hours which would have needed as many days to be cut out by hand. Upon wood the action of the sand-blast is not so satisfactory, being slow and tedious, and the only way in which it can be utilized on this material is in cutting out the large block type used in printing posters. The foregoing are only a few of the ways in which the sand-blast has manifested its usefulness, but as the invention is still in its infancy it is impossible to say what applications may not be found for it in the future.

SAND-CRACK is a splitting or fracture of the horny fibers of the horse's hoof, extending usually from above downward; when reaching to the quick it causes lameness, and in all cases it constitutes unsoundness. Horses with thin, weak, brittle feet, spoilt by much rasping, and rattled on the hard roads, furnish the majority of cases. The horn must be thinned for an eighth of an inch on either side of the crack; across the upper and lower ends of the crack, to prevent its extension, the firing-iron should be drawn, making a line nearly through the horny crust. The opening may further be held together by winding round the foot several yards of waxed string, or fine iron wire. Except in very bad cases, slow work on soft land may be permitted, but road work is injurious. The growth of healthy horn is promoted by applying round the coronet, at intervals of 10 days, some mild blistering liniment.

SANDEAU, LÉONARD SYLVAIN JULES, 1811-83; b. Aubusson, France; studied law in Paris, but by association with George Sand (see DUDEVANT) was drawn into literature. The pair wrote their first novel, *Rose et Blanche*, 1831, in collaboration, under the pseudonym of Jules Sand. S. subsequently produced a number of works of which the best are *Mademoiselle de Kérourat*, 1842; *Mlle. de la Seiglière*, 1848; *Sacs et Parchemins*, 1851; and *La Maison de Penarvan*, 1858. He dramatized many of these novels, assisted Emil Augier in writing *Le Gendre de M. Poirier* and other successful comedies, and was a frequent contributor to leading French journals and reviews. He was elected a member of the Acad., 1858.

SAND-EEL. See LAUNCE.

SANDEMAN, ROBERT, 1718-71; b. Scotland; studied 2 years at Edinburgh, and soon engaged in the linen trade; adopted the views of a Mr. Glas (see GLASSITES), against church establishments; became an elder in his church; published in 1757 a reply to *Hervey's Dialogues*; removed to London in 1760; attracted much attention by his preaching, and formed a congregation whose members took the name of Sandemanians. In 1764 he removed to America, established a society in Boston, and in 1765 settled in Danbury, Conn. He published *Correspondence with Mr. Pike; Thoughts on Christianity; Sign of the Prophet Jonah*.

SANDEMANIANS. See GLASSITES.

SANDERLING, *Calidris*, a genus of birds of the plover family (*charadriadae*), or which perhaps ought rather to be referred to the snipe family (*scolopacidae*). The common sanderling (*C. arenaria*) is a very widely diffused bird, breeding in the Arctic regions, and migrating southward on the approach of winter as far as the coasts of Africa, of India, and of Brazil. It is pretty common on the British coasts, in small flocks, in winter. It is only about 8 in. long; its winter plumage very light ash-gray, under parts white. In spring the plumage acquires a reddish tinge with black markings. The sanderling feeds on marine worms, small crustaceans, etc. It is esteemed for the table, and appears in the London market.

SANDERS, GEORGE NICHOLAS, 1812-73; b. Ky.; a grandson of col. Nicholas, who moved the famous Kentucky resolutions of 1798. He early became prominent as a democratic speaker and politician, was U. S. consul to Liverpool during Pierce's administration, and naval agent at New York during Buchanan's. He advocated the election of Douglas in 1860, and during the civil war was joint commissioner with Mason and Slidell to European powers. In association with Clement C. Clay and J. P. Holcomb he met Horace Greeley at the "peace conference" at Niagara Falls, July, 1864.

SANDERS or **SAUNDERS**, NICHOLAS, a controversial writer, was born in England about 1527, went to Rome and was ordained priest there in 1560, was present at the council of Trent; remained several years in Louvain and published (1571) *De visibili Monarchia Ecclesiae*. He was sent to Madrid in 1573 by the pope to organize an expedition to romanize England. After the failure of this enterprise he died in 1581. He published *The Supper of our Lord* (1565); *The Rocke of the Churche* (1566); *A Treatise of the Images of Christ* (1567).

SANDERSON, JOHN, 1783-1844; b. Penn.; studied law at Philadelphia, and in 1836 became professor of classical languages at the Philadelphia high school. He contributed papers and sketches of travel to the *Portfolio* *Knickerbocker*, and other magazines. He wrote *Sketches of Paris*, 1838; and with his brother, J. M., was author of *Lives of the Signers of the Declaration of Independence*.

SANDERSON, ROBERT, D.D., 1587-1663; b. England; educated at Lincoln college, Oxford; ordained in 1611; was sub-rector in Lincoln college 1613-16; proctor of Oxford in 1616; bachelor of divinity in 1617; rector of Wilberton in 1618, and of Boothby Pennell from 1619 for over 40 years; prebend of Lincoln in 1629. Upon the recommendation of Laud he became in 1631 chaplain to Charles I., who in 1642 appointed him regius professor of divinity at Oxford. At the restoration he was consecrated bishop of Lincoln; was moderator at the Savoy conference between the Episcopal and Presbyterian divines. He published *Logica Artis Compendium*; *Judicium Universitatis Oxoniensis*; *De Obligatione Conscientiae Praelectiones*; *A Collection of Sermons*.

SAND GROUSE. See GANGA.

SAND-HILL CRANE, or BROWN CRANE, *Grus Canadensis*, a very large species of crane found in the Mississippi valley and western portion of the United States. It is a shy bird, with acute sight and hearing. Its body is about 4 ft. long; wings nearly 2 ft., with an immense spread. Length of tarsi about 10 in., and the bill longer than the middle toe. When wounded it is said to be dangerous to approach, as a thrust of its bill may inflict a severe wound.

SAND-HOPPER, *Talitrus locusta*, a small crustacean, of the section *edriophthalma* (q.v.) and order *amphipoda*, which so abounds on the sandy sea-shores of Britain that the whole surface of the sand often seems to be alive with the multitudes which, leaping up for a few inches into the air, fill it like a swarm of dancing flies. This activity is not, however, displayed at all times; but if a mass of sea-weed left by the retiring tide be turned over, countless sand-hoppers may be seen to leap away, or they may be found by digging in the sand, in which they burrow. The sand-hopper leaps by bending the body together, and throwing it open with a sudden jerk. It feeds on almost any vegetable or animal substance, particularly on what is already dead and beginning to decay. It is itself the food of crabs, and of many kinds of birds. See illus., CRUSTACEANS, vol. IV. fig. 20.

SANDHURST, a city of Victoria, 60 m. n.e. of Ballarat, on the railway between Melbourne and Ebuca. It is the centre of an important gold mining, wine making, and agricultural district. Pop. '91, 26,744. It is also called Bendigo.

SANDHURST, ROYAL MILITARY COLLEGE. In 1802 it was determined to institute a college for the training of English officers, in which professional education should be grafted on the groundwork of general instruction. The college was opened at Great Marlow; but, in 1812, it was transferred to a handsome stone building at Sandhurst. Up to 1862 this was devoted to the education of boys from the age of 13 upwards. In that year, however, the system was changed; the course limited to one year immediately before entering the army, and the subjects of instruction confined to the higher mathematics, modern languages, and military science. Entrance was on the nomination of the commander-in-chief; and the payment by the cadet's parent or guardian varies from £100 to nil, according to the circumstances and rank of the parent. Those for whom no payment is made must be orphans, and are styled "Queen's cadets." Under the pur-

chase system, all first commissions in the cavalry and infantry of the line, which were granted without purchase, and not to men from the ranks, were given to cadets from the Royal Military College, who competed for these prizes, and obtained them in order of merit.

The abolition of purchase in 1871 brought about a radical change. The students are no longer boys intending to become officers, but sub-lieutenants, who, having passed by competition for the army, spend a year at Sandhurst in acquiring the theoretical part of the war science. To be confirmed in the army as lieutenant, the officer must pass creditably out of Sandhurst, and then serve a year on probation with a regiment. It cannot be doubted that this change of system must tend, as years go on, to secure for the army a great body of scientific officers.

The Staff College (q.v.) is a separate institution, about 2 m. distant.

The estimated charge for the Royal Military College for 1881-82 was £40,642, of which about £5000 is covered by the payments for the students.

SAN DIEGO, a co. of s. California; bounded e. by the Colorado river, s. by Lower California, w. by the Pacific ocean; traversed from n. to s. by two branches of the Coast range, which divide it into three sections, differing greatly in climate, soil, and other particulars; 14,548 sq. m.; pop. '90, 34,987. The section near the coast consists of level plains or undulating valleys, watered by the San Bernardo, San Diego, San Luis Rey, Margarita, and other rivers, and most of it is adapted to agriculture and grazing. The eastern part is a naked, sterile, sandy plain, called the great Colorado desert, and exceedingly hot, the mercury rising to 122° Fahr. in the shade. Between the mountains and the sea the soil is fertile, producing wheat, barley, oranges, olives, dates, and other tropical fruits. The mountains are covered with forests of oak, pine, fir, and cedar. The highest point is mount San Jacinto, 5,500 feet. Gold and silver are found. Co. seat, San Diego.

SAN DIEGO, city, port of entry, and co. seat of San Diego co., Cal.; on San Diego bay and the National City and Otay, the San Diego, Cuyamaca, and Eastern, the San Diego, Pacific Beach and La Jolla, and the Southern California railroads; 120 miles s.e. of Los Angeles. It has what is considered after that of San Francisco the largest and best harbor of the United States on the Pacific. The first of the California missions was established here in 1769, and the new town was laid out in 1867. The city contains a U. S. custom-house, several public parks, public library, electric light and street railroad plants, national, state, and private banks, board of trade, chamber of commerce, and flour and planing mills, carriage and wagon factories, salt works, foundry, and machine shops, etc. Among objects of local interest are the San Diego mission, La Jolla cave, Sweetwater dam, and the monument on the Mexican boundary. Pop. '90, 16,159.

SANDIVER, a product of the glass furnaces. When the materials used in the manufacture of glass are melted, a scum arises which has to be removed; this is called sandiver, and is, when powdered, used as a polishing material, and formerly had a considerable reputation as a tooth-powder.

SAND-MARTIN. See SWALLOW.

SAN DOMINGO (see DOMINGO, SAN). The annexation of San Domingo to the United States has been a favorite project among certain political leaders and with democratic administrations since 1845, when negotiations to this end were begun, and an American commissioner sent to explore the island. Under President Pierce, Capt. (afterward Maj.-gen.) Geo. B. McClellan was ordered to make a survey of Samana bay, with a view to acquiring it as a naval station. His report was in favor of such an acquisition, and new negotiations were opened, but without practical result. In 1867 Mr. Seward, secretary of state, with other officials, visited the Dominican capital, and the matter was again reopened—and again postponed. During the beginning of Gen. Grant's presidency, the Baez government of San Domingo made overtures in the direction of annexation, and at length the president sent Gen O. E. Babcock to confer with that government on the subject, when a treaty was actually drawn, by which, on payment of \$1,500,000, the Dominican republic was to become a territory of the United States. This treaty was ratified by a vote of the people of San Domingo, 15,000 to 400. The treaty was referred to the U. S. senate, where it met with bitter opposition, complicated by various personal and political questions, and where it was defeated. The president then recommended the appointment of a commission by congress to proceed to the republic and investigate and report upon all previous proceedings. Benj. F. Wade of Ohio, Andrew D. White of New York, and Samuel G. Howe of Boston were appointed such commissioners, and visited Samana bay in 1871, examining the resources of the country, the condition of the people, and popular feeling on the subject of annexation. The report of the commissioners was exhaustive, and entirely favorable to the plan of annexation. It was laid before congress by President Grant, but no action was taken concerning it. Subsequently the Samana bay company in New York leased the peninsula and bay of Samana from the Baez government, with certain trade privileges, at an annual rent of \$150,000, but met with no decided success. In 1874 the Dominican government again made overtures to the government of the

United States, urging positive action in the matter, but the annexation was not consummated.

SAN DONA. See DONA, SAN.

SANDOVAL, Fray PRUDENCIO DE, 1560-1621; b. Valladolid; educated for the church, took orders at the Benedictine convent of Santa Maria la Real de Naxera, and devoted years in that retirement to the study of the antiquities of Spain. He was made historiographer of Spain by Philip III., and for valuable services was rewarded by the bishopric of Tuy in 1608, and of Pemplona in 1612. He published various histories of Spain and editions of the ancient chronicles.

SAND-PAPER is made in the same way as emery-paper (see EMERY), but with sand in place of emery. Powdered glass is also used for it, and muslin instead of paper.

SANDPIPER, the common English name of a numerous group of birds, generally referred to the family *scolopacidae*, all formerly included in the genus *tringa*, but some now constituting the genera *totanus*, *pelidna*, *actitis*, etc., of ornithologists. In characters and habits they are all very similar. They are not of large size; they are very active and graceful in all their movements; their plumage not gay, but of pleasing and finely diversified colors; their legs are rather long, the lower part of the tibia naked, the tail very short, the wings moderately long; the bill rather long and slender, grooved throughout the whole or a considerable part of its length, straight in some, and a little arched in others. The feet have three long toes before, and one short toe behind; the toes in the genus *tringa*, as now restricted, are partially webbed at the base; in *totanus* they are completely separate. They are good swimmers, but are not, however, often seen swimming; they frequent sandy sea-shores, some of them congregating in numerous flocks in autumn and winter; and seek their food by probing the sand with their bills, and by catching small crustaceans in pools or within the margin of the sea itself. Many are birds of passage, visiting high northern latitudes in summer, and spending the winter on the coasts of more southern regions. The flesh of all the species is good, and some of them are in much request for the table.—The British species are numerous. The DUNLIN or PURRE (*tringa variabilis*) is noticed in the article DUNLIN.—The KNOT (*tringa canutus*), also known, in different states of plumage, as the RED SANDPIPER and the ASH-COLORED SANDPIPER, is a bird of about 10 in. in length, appearing in great flocks on the British coasts in winter, and equally common in North America.—The LITTLE SANDPIPER, or LITTLE STINT (*tringa minuta*), occasionally seen in Britain, occurs in India and in South Africa. The name STINT is given to a number of species of *tringa*.—The PURPLE SANDPIPER (*tringa maritima*), not unfrequently on the British coasts, is reckoned among the birds of Iceland, Greenland, Melville island, Nova Zembla, and Spitzbergen.—Of the genus *totanus*, to all the species of which the popular name GAMBET is sometimes given, one of the best-known species is the REDSHANK (*totanus calidris*), a bird which resides in Britain all the year, but known also as a summer bird of passage in the most northern parts of Europe and Asia, and occurring in winter as far s. as Smyrna, and even in India. It is about 11 in. long. It receives its popular name from its red legs.—The GREEN SANDPIPER (*totanus ochropus*) is also a pretty common British species, for the most part migrating to the north for the summer.—The COMMON SANDPIPER or SUMMER SNIPE (*totanus hypoleucos*) is in Britain a summer bird of passage.—The GREENSHANK (*totanus gottis*) is chiefly seen in Britain in spring and autumn, and has its name from the olive-green color of its legs.—Sandpipers of various species—some of them the same as the British, and others different—are numerous in North America, and in winter in the West Indies.

SANDPIPES are cylindrical hollows existing in chalk deposits. They descend perpendicularly into the chalk at right angles to the surface, tapering downward, and ending in a point; they reach occasionally a depth of 60 ft., and have a diameter varying from 1 to 12 feet. They are most probably produced by the chemical action of water, charged with carbonic acid, which exists more or less in all rain-water, and is especially abundant in water that has been in contact with decaying organic matter. The pipes are filled with sand, clay, or gravel from the overlying deposit.

SANDROCOTTUS, or SANDROKRYPTOS, is the Greek spelling of the name of the Hindu king Chandragupta, of Pât'aliputra or Palibothra, to whom Megasthenes was sent as ambassador from Seleucus Nicator, and who lived about the beginning of the 4th c. B. C.

SANDS, BENJAMIN FRANKLIN, b. Md., 1811; educated at the naval academy, and was appointed midshipman, 1838. He served in the coast surveys of 1836 and 1851, and was present at the capture of Tabasco, Mexico, 1847. At the beginning of the civil war he had reached the rank of commander, and in 1862 was made capt. He took part in the attack on fort Caswell, the two on fort Fisher, and in the Wilmington blockade. In 1866 he was made commodore, was appointed supt. of the naval observatory in 1867, and in 1871 was raised to the rank of rear-admiral. He. d. 1883.

SANDS, ROBERT CHARLES, 1799-1832; b. Flatbush, L. I., son of Comfort; a member of the New York constitutional convention 1777. He graduated from Columbia college 1815; studied law, was admitted to the bar in 1820, but chose the profession of literature. He was a frequent contributor to the press in prose and verse; and, associated with others, ably edited and published several journals. The last poem from his pen,

The Dead of 1832, was published in the *Commercial Advertiser*, of which for the last 5 years of his life he was assistant editor. He published in 1831 the *Life and Correspondence of Paul Jones*. Selections of his writings, with a memoir of his life, have been published.

SANDSTONE is a rock formed of compacted, and more or less indurated, sand. The grains generally consist of quartz, though other mineral substances are often mixed with this; they are colorless, or of a dull white, yellow, brown, red, or green color. The grains vary in size, forming, as the case may be, a fine or coarse grained stone. The loose sand becomes solidified by pressure simply, but more generally from being cemented together by calcareous, silicious, or ferruginous infiltrations, and the dark color of the mass is produced by the cement. Sandstones that have undergone great or continuous metamorphic action pass into quartzite; and between this and friable sand, all intermediate stages are found.

SANDUSKY, a co. in north Ohio, bounded on the north by Sandusky bay, drained by the Sandusky and the Portage rivers, and by Muddy and Green creeks; on the Lake Shore and Michigan Southern, the New York, Lake Erie, and Western, and the Wheeling and Lake Erie railroads; about 418 sq. m.; pop. '90, 30,617, chiefly of American birth. The surface is level and heavily wooded. The soil is fertile. The principal productions are corn, oats, wheat, hay, and live stock. Co. seat, Fremont.

SANDUSKY, city and co. seat of Erie co., Ohio, at the mouth of Sandusky river and on Sandusky bay, an arm of lake Erie, 56 miles west of Cleveland. The bay is 20 miles long and 5 miles wide, with average depth of 14 feet, and an increasing business is done by water as well as by the Baltimore and Ohio, Lake Shore and Michigan Southern, and other railroads that enter, there being large exports of fresh and salted fish, coal, ice, lumber, iron ore, limestone, and lime, apples, grapes, and wine, besides manufactured articles such as handles, spokes and hubs, "bent work," boilers, threshing machines, and carpenters' tools. Wool and grain are received from the country in large amounts. The fisheries and the grape and wine business employ a large number of persons, the city being one of the largest fresh fish markets in the world, and the center of a great vine-growing district. The city is built on ground sloping to the bay, commanding a beautiful view. The public buildings, which are mostly built of the limestone found in the city limits, include the most costly high school in the state, and a handsome courthouse. There are national banks, a public library, waterworks, and many periodicals. The state fish-hatchery is situated here. Near the city is a favorite place for camp-meetings and other gatherings, called Lakeside, and there are some beautiful islands in the bay that are much resorted to by pleasure seekers. The city has electric lights, electric street railroads, and waterworks supplied from lake Erie. Pop. '90, 18,471.

SAND WASP. See *SPHEGIDÆ*.

SANDWICH, a favorite viand, which is said to have been named after the earl of Sandwich. It consists of two thin slices of bread, plain or buttered, with some savory food placed between. Formerly it was applied exclusively to bread with thin slices of ham, tongue, or beef, but of late a great variety of materials have been used.

SANDWICH (i. e., village on the sands), a cinque port, market t., and municipal and parliamentary borough of Kent, on the right bank of the Stour, 11 miles n. of Dover. Within the last 800 years the sea has here considerably receded, for Sandwich, which is now 2 m. from the shore, is described, at the commencement of the 11th c., as the most famous of all the English harbors—*omnium Anglorum portuum famosissimus*. It can still be reached by vessels drawing not more than 12 ft. The town is rectangular, and was surrounded by walls, along which a broad path now leads. The streets are confined, and the houses, which seem crushed together, and the architecture of which recalls the times of the Plantagenets, are peculiarly and strikingly antique in appearance. The church of St. Clement's, with a low Norman tower, is probably the most interesting edifice. Small vessels importing timber, iron, and coal, and exporting corn, flour, malt, seeds, and hops, come up to the town. Pop. '91, 2,796.

Sandwich, the most ancient of the cinque ports, probably occupies the site of the Roman *Rutupie*, and many interesting antiquities have been found in the vicinity. In the reign of Edward IV. its customs yielded £17,000 yearly, and 95 ships and 1500 sailors belonged to it.

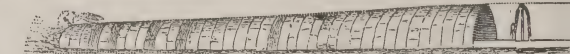
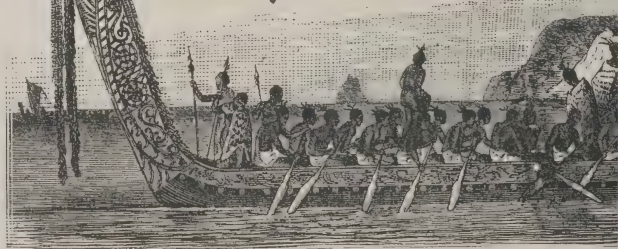
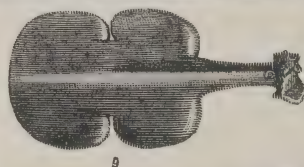
SANDWICH, a town in Barnstable co., Mass.; on Cape Cod bay and the New York, New Haven, and Hartford railroad; 62 miles s. of Boston. It was incorporated in 1638, and contains the villages of Forestdale, East Sandwich, South Sandwich, Spring Hill, Farmersville, Greenville, and Wakeby. The town commands a fine view of the bay, and is largely built up with summer homes. There are a high school, public library, water supply from springs, co-operative bank, and manufactories of silk, glass, and tacks. Other local industries are cranberry culture and fishing. The principal village is on the n. side of the cape, pleasantly situated in a valley, and from the hills which nearly surround it a view of Provincetown may be obtained. It is much frequented by sportsmen, having fine facilities for boating, bathing, and fishing, and in the adjacent forests the fox, the deer, and a variety of game are found. Pop. '90, 1819.

SANDWICH ISLANDS, forming the Republic of Hawaii, are a rich, beautiful, and interesting chain, eight in number, exclusive of one or two small islets. The chain runs from s. e. to n. w., and lies in the middle of the Pacific ocean, in lat. 19° to 22° n., long. 155° to 160° w. Area, 6640 sq. m. The names, with the areas of the respective islands, are: Hawaii (formerly Owhyhee), 4210 sq. m.; Maui, 760; Oahu, 600; Kauai, 590; Molokai, 270; Lanai, 150; Niihau, about 100; and Kahulawe, about 60 sq. m. A census was completed in 1897 returning a total population of 109,020, in which the most numerous element was the Hawaiian, numbering 31,019. The Japanese stood next, with 24,407, the Chinese with 21,616, the Portuguese numbered 15,191, the Americans 3,086, the British 2,250, and the Germans 1,432.

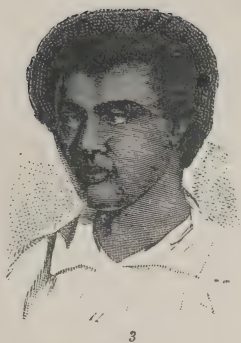
SURFACE, ETC.—Situating near the middle of the Pacific Ocean, about half the distance from San Francisco in North America that they are from Melbourne in Australia, and Canton in China, the Sandwich Islands form an oasis in the middle of a wide ocean waste, and offer convenient stations for the refreshment and repair of the merchantmen and whalers that traverse the Pacific. They are of volcanic origin, and contain the largest volcanoes, both active and quiescent, in the world. The most prominent physical features of the group are the two lofty mountain peaks of Hawaii, Mauna Kea, and Mauna Loa, each of which is 14,000 ft. in height, or within 1800 ft. of the loftiest of the Alps. Besides these two chief peaks, which stand apart from each other, and one of which is covered with perpetual snow, the island is traversed by other mountains, which give it a rugged and picturesque outline, and in some cases front the sea in bold, perpendicular precipices, from 1000 to 3,000 ft. in height. In general, the islands are lofty—the small islet of Lehua is 1000 ft. high, and the upland regions of Kauai are, on an average, 4,000 ft. above sea-level. Within the coral reefs, which, in single, and more rarely in double ridges, skirt portions of the coasts, sandy shores, leading up to rich pasture-lands, and occasionally to productive valleys, are frequently seen. Everywhere, however, the configuration of the surface betrays the volcanic origin of the islands. Extinct and partially active volcanoes occur in most of the islands. Kilauea, on the Mauna Loa mountain in Hawaii, the largest active volcano in the world, has an oval-shaped crater 9 m. in circumference, and is 6,000 ft. above sea level. In the center of this immense caldron is a red sea of lava, always in a state of fusion. At intervals the lava is thrown to a great height, and rolls in rivers down the mountain sides. From 1856 to 1859 this volcano was in an incessant state of eruption, forming at night a sublime spectacle, and occasionally casting forth burning streams, by one of which a small fishing-village was destroyed, a bay on the shore filled up, and a promontory formed in its place. On Maui, the crater of Mauna Haleakala (house of the sun), by far the largest known, is from 25 to 30 m. in circumference, from 2,000 to 3,000 ft. deep, and stands 10,000 ft. above sea-level. Within this huge pit, about 16 basins of old volcanoes, whose ridges formed concentric circles, have been counted. Good harbors are few. The chief is that of Honolulu (q. v.), in Oahu, with $2\frac{1}{2}$ ft. of water in its shallowest parts. On the same island is Ewa, an immense basin, with 12 ft. water at low tides. During the prevalence of the trade-wind, which blows s.w. for about nine months of the year, the s. shores of the islands afford safe anchorage almost everywhere.

CLIMATE, SOIL, RIVERS, ETC.—Though situated within the tropics, the Sandwich Islands boast a climate that is temperate rather than tropical. In the native language, there is no word to express the idea of *weather*, and this fact may be considered as evidence that extremes of heat or cold do not occur. At Honolulu the extremes of temperature in the shade during 12 years were 90° and 53° , and the diurnal range is 12° . Rains brought by the n.e. trade-wind are frequent on the mountains; but on the leeward side of the islands, little rain falls, and the sun is rarely obscured by clouds. The soil, the constituent parts of which are mainly scorie, decomposed lava, and sand, is generally thin and poor. This, however, is not universally the case. At the bases of the mountains and in the valleys, where abrasion, disintegration, and the accumulation of vegetable mold have gone on for ages, there are extensive tracts as fertile as they are beautiful. The islands produce fine pasturage in abundance, and large herds are bred and fattened, to supply meat to the whalers and merchant-ships. The upland slopes of the mountains are clothed with dense forests; and lower down are grassy plains and sugar and coffee plantations. Basalt, compact lava, coral-rock and sandstone, are used for building purposes. Vast numbers of semi-wild horses roam the islands, and, while they consume the pasturage and break down the fences, are of little use. The indigenous fauna is small, and consists mainly of swine, dogs, rats, a bat that flies by day, birds of beautiful plumage, but for the most part songless. Among the indigenous trees and plants are the sugar-cane, banana, plantain, cocoa-nut, candle-nut, various palms, the taro, a succulent root which formed the staple of the food of the natives, and is still generally used; the cloth-plant; and the *ti*, the roots of which were baked and eaten, while the leaves were used for thatching huts. Cattle and other useful foreign animals and plants were introduced by Vancouver and other navigators.

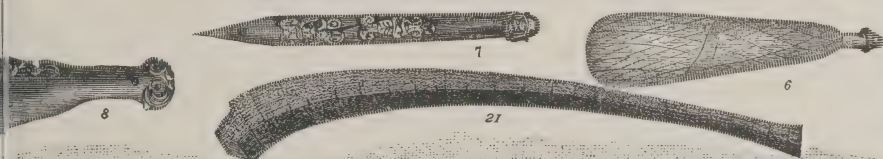
COMMERCE, PRODUCTS, ETC.—The commerce of this young kingdom is still in its infancy, but is gradually on the increase. Sugar is the main article of export and is shipped almost exclusively to the United States, which country receives almost all of the Hawaiian exports. In 1896 the total value of the exports was \$15,515,230, which, with the exception of goods to the value of less than \$60,000, went to the United States ports, the Pacific ports alone receiving 76.4% of the entire commerce. The sugar exported amounted to nearly \$15,000,000, and, with the exception of less than \$200



SANDWICH ISLANDS, NEW ZEALAND, AND TAHITI.—1. Kamehameha's temple. 2. Kam
6, 7, 8, 9. Maori clubs. 10. Paratonga idol. 11. Heva (priest of the dead) Maori.
16. Maori tomb-stone. 17. Head-rest. 18. Tahitian cemetery. 19. Stone idols.



11



1. Maori chief. 2. Tonga chief. 3. Tonga chief. 4. Carved box. 5. New Zealand war-boat. 6. Maori chief. 11. Hut at Waihu, 310 feet long. 13. Tahiti idol. 14. Maori carved door. 15. Tahitian tattooing implements. 17. Maori chief. 21. Tongan club.

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worth, went to the United States ports. Among the other exports are rice, bananas, coffee, hides, wool, pineapples, skins, and canned fruits. As will naturally appear from these figures, the trade with Hawaii is almost exclusively American and by far the greater portion of merchandise is carried in American bottoms. As to the imports, the United States enjoys by far the greatest part of the trade. In 1896, 76.27% of the imports came from United States ports. Great Britain stood next in respect to the importance of the import trade. The exports exceeded the imports at the ratio nearly of 2 to 1. The latter included a great variety of manufactured articles and some food products, groceries and provisions being important items on the list. Several steamship lines ply between Honolulu and the United States, the time consumed by steamers between that port and San Francisco being from six to seven days. In 1897 there were three railways on the islands, and the mileage amounted to 63 miles. The Hawaiian money is paper and silver, but there is a large amount of American gold in circulation and some United States silver and paper are also in circulation on the islands.

HISTORY AND CONSTITUTION.—Of the origin and character of the inhabitants of this country, of its interesting internal history, or of the much-canvassed question as to whether the native race will flourish along with or wither before the Saxon race, it is not within our limits to speak. We can only notice a few of the leading events which have occurred in these islands since their shores were first visited by what the natives called the "floating islands" of the civilized nations. Although one member of the group was seen by Gaetano in 1542, the islands cannot be said to have been discovered till Cook visited them in 1778. The great navigator treated the simple and confiding natives with a cruelty and a hypocrisy which consort ill with his fame, and which were the direct causes of the brawl in which he met the death he had provoked in Kealeakekua bay, Hawaii, 1779. In early times each island had a king; but under Kamehameha I., a man of shrewd sense, and of great bravery and resource, the islands were formed into one kingdom. This king, writing to George III., Aug. 6, 1810, desired formally to acknowledge the king of England as his sovereign, and to place the islands under British protection—an offer which was accepted. After inaugurating the era of advancement, this king died in 1819, and was succeeded by Liholiho, who adopted, on his accession, the name of Kamehameha II., and in whose reign idolatry was abolished simultaneously throughout all the islands. The first Christians who visited the Sandwich islands were Cook and his followers, of whom the simple natives retained no favorable impression. Vancouver, who arrived with Cook in 1778 and returned in 1792, and again in 1794, made sincere attempts to enlighten the natives, and the king and his chiefs requested Vancouver to send out religious teachers to them from England; but the first missionaries that visited the islands came from America in 1820. On their arrival, the missionaries witnessed the singular phenomenon of a nation without a religion. The instructions of Vancouver had not been forgotten, and no doubt enabled the idol-worshipping islanders to see more readily the absurdities of their system. But the spontaneous movement of 1819-20, when the whole nation rose up to destroy idols, temples, and the furniture of idolatry, "was no triumph of Christianity—for Christianity had not yet claimed or even approached the Hawaiian islands." The nation had voluntarily cast off the religion of their ancestors, and had not yet adopted—were not even acquainted with—any other system. The American missionaries who arrived in 1820 were well received, and the work of instruction was at once begun. Besides instructing them in Christianity, in less than 40 years they taught the whole people to read and write.

Kamehameha II. and his queen visited England, and after a short residence in this country, both died in London, July, 1824. Prior to the year 1838 the government was a despotism; but in 1840 the king, Kamehameha III., granted a constitution, consisting of king, assembly of nobles, and representative council. This constitution, based on that of Great Britain, was in more recent times much matured and improved. In 1843 the independence of the Hawaiian kingdom was formally declared by the French and English governments. Kamehameha IV. acceded to the throne in 1854, and, after a brief but useful reign, died in Nov., 1863, and was succeeded by his brother, Kamehameha V. Lunalilo followed him in 1873, and on his death, Kalakaua in 1874. In 1875 a commercial reciprocity treaty was concluded with the U. S., in accordance with which unrefined sugar is admitted into the latter country duty free. In 1891 King Kalakaua while on a visit to the United States died suddenly at San Francisco, and was succeeded by his eldest sister, Liliuokalani, deposed by a revolution in 1893, organized by the foreign residents, especially the Americans, who set up a provisional government and sent commissioners to Washington to ask for annexation to the United States. This offer was rejected by the Cleveland administration, and its provisional government thereupon called a convention, which drew up a new constitution, under which Hawaii became a republic, with Sanford B. Dole, an American by birth, as its first president. The new republic was proclaimed July 4, 1894. The suffrage under the new constitution is largely based on the property qualification. The President is assisted by a council, and there is also an elected legislature. A treaty for the annexation of the Sandwich Islands to the United States was drawn up in 1897, signed by the representatives of both countries on June 16, and submitted to the senate of the United States for ratification.

The Sandwich Islands were so named by Capt. Cook, but that name is not found in the constitution and laws of the islands. They are there called the Hawaiian

Islands, which is the name used by the people. Their distance from Panama is 4,800 m., from San Francisco 2,100 m., and from Japan 3,400. They are ten in number. The group contains 6,640 sq. miles. The four largest and most important are Hawaii, Maui, Oahu, and Kauai. Kaula and Molokai are little more than barren rocks.—**HAWAII**, formerly called Owhyhee, is 800 m. in circuit, and twice as large as all the others together. It is in the form of a triangle, is 100 m. long from n. to s., and 80 broad. The interior, a table-land, 8,000 ft. above the sea, is chiefly covered with lava and ashes, but in some places overgrown with wanti trees or paper-mulberry trees. From this plateau the land gradually slopes toward the sea. There are three mountains, Mauna Kea, Mauna Loa, and Mauna Hualalai, near the edges of this table-land. The higher part of this slope, to about 4 m. from the shore, is covered with dense forests of acacia, which grows very large, and of which the natives make their canoes. The soil on which these trees grow lies on lava, which often appears above it. The tract w. of Byron Bay or Waiakea, extending toward the base of the volcano Mauna Kea, is thickly inhabited and well cultivated; but nearly contiguous to it on the s. is a desert of lava extending 40 m. along the shore, without cultivation, and inhabited only by fishermen. The north-eastern coast is bold and steep. Byron Bay, on the eastern shore, has a spacious harbor lying s. and n. protected from the n.e. wind by a coral reef half a mile wide, leaving a channel three-quarters of a mile wide and from 3 to 10 fathoms deep. It is the best harbor of the island. In the Kealakehwa harbor, on the w. coast, Capt. Cook was killed. The principal town is Hilo.—**MAUI** lies n.w. of Hawaii, separated from it by a strait 24 m. wide. It is 48 m. long, 29 broad. It is composed of two masses of rock, surrounded by a narrow tract of low land united by a low and sandy isthmus 9 m. in width. The larger mountain, occupying the e. part, is 10,000 ft. high, and has but little cultivable land; the smaller mountain mass, or peninsula, has a fine tract of level land along the s.w. coast. The harbor of Lahaina, the principal town, nearly in the center of the plain, is formed by two low projecting rocks, 2 m. distant from each other.—**KAUAI**, 33 m. long, 28 broad, is a mountain mass sloping on all sides toward the sea, where it terminates with a high coast. The valleys are fertile and well cultivated.—**OAHU**, 46 m. long, 23 broad, has a larger quantity of cultivated land than the other islands, an extensive foreign commerce, and is the most populous of the whole group. A mountain range traverses the island from n.e. to s.w., terminating at Diamond Point, the s.w. cape, in a hill 400 ft. high. This range, with the valleys which intersect it, covers half the surface of the island. Another mountain mass is in the n.w., separated from the other by a plain 20 m. in extent, called the plain of Eva, which is fertile and well-wooded, but not much cultivated. The soil is a deep mold, resting on lava. The plain of Honolulu, extending 10 m. along the s. shore, from 2 to 3 m. in width, has a rich alluvial soil, and is highly cultivated. Honolulu (q.v.) is the capital of the islands and the residence of the king. It has an excellent harbor, which, though small, is deep and perfectly safe. It is formed and protected by a coral reef extending some distance along the shore.—**MOLOKAI**, extending 40 m. from e. to w. and 7 m. from s. to n., is a mass of rocks, the highest portion rising 5,000 ft. and the sides having deep ravines full of trees. There are level tracts along the shore, many of them fertile.—**KAHULAWÉ** lies s.w. of the larger peninsula of Maui; is 11 m. long and 8 broad. It is, like the other islands, composed of lava. The soil is thin, and covered with a coarse grass.—**LANAI**, w. of the smaller peninsula of Maui, separated from that island by a strait 9 or 10 m. wide, is 17 m. long, 9 wide, and is a mass of low volcanic rocks. A large part of it is barren, and there are but few inhabitants.—**NIHAU**, the most western of the islands, is 20 m. long, 7 broad. The only mineral obtained in abundance on the Islands is salt. A large quantity is taken from a salt lake in the island of Oahu, which is between 2 and 3 m. in circuit. There are also artificial vats of clay along the sea-shore, into which the water from the sea is let at high-tide, and large quantities of salt obtained by evaporation. The Hawaiians are supposed to belong to the family of Malay nations. Their complexion is tawny, inclining to olive; they are of middle stature, well formed, with muscular limbs and open countenance. They are expert in swimming, and are good fishermen and horsemen. The Hawaiian nation is believed to have a considerable antiquity. Persons have been appointed from time immemorial to keep the genealogy of their kings unimpaired, and this embraces the names of more than 70 kings. The population in 1778 was estimated by the discoverer at 400,000. When the missionaries arrived, in 1820, they estimated it from 130,000 to 150,000, but since that it has been, from various causes, steadily decreasing, so that in 1884 the official census gave but 80,578. For an account of the Hawaiian kings, see **KAMEHAMEHA**; and for the present religious condition of the islands, see **MISSIONS, FOREIGN**. There are Roman Catholic and English bishoprics at Honolulu.

SANDY HOOK, a low, narrow, sandy peninsula, running about 6 m. to the n. from Monmouth co., N. J., about 16 m. s. of New York. It has a light-house about $\frac{3}{4}$ of a m. from the n. end, a heavy ordnance proving-ground belonging to the U. S. government, and important fortifications named in honor of Gen. W. S. Hancock.

SANDYS, EDWIN, D.D., 1519–88; b. Lancashire; educated at St. John's college, Cambridge, where he became favorable to the reformation: was junior proctor, 1542; master of Catharine hall, 1547, and vicar of Haversham; prebendary of Peterborough, 1548, and of Carlisle, 1552; vice-chancellor of Cambridge, 1553. Having preached in favor of



REFERENCES.

DEPOTS.
1. Southern Pacific R. R., N. 5

HOTELS.
3. Baldwin, M. 4
4. California, M. 3
5. Cliff House, A. 4
6. Grand, N. 3
7. Lick House, M. 3
8. Occidental, N. 3
9. Palace, N. 3
10. Russ House, M. 3

PROMINENT INSTITUTIONS
AND BUILDINGS.

12. Academy of Sciences, M. 4
13. Anglo-California Bank, N. 3
14. Bank of California, N. 2
15. California Market, M. 3
16. Center Market, M. 3
17. Chronicle Building, M. 3
18. City Hall, L. 4
19. Custom House and P. O., N. 2
20. First National Bank, N. 3
21. Mehan. Institute Pavilion, L. 5
22. Mercantile Library, N. 3
23. Merchants Exchange, N. 3
24. Nevada Bank, N. 3
25. Old Fellows Hall, M. 3
26. San Francisco Stock Exch., N. 3
27. Union Iron Works, P. 7
28. U. S. Appraisers Building, N. 2
29. U. S. Branch Mint, M. 4
30. U. S. Treasury, N. 2

CHURCHES.

35. Calvary Presbyterian, M. 3
36. Cathedral, K. 4
37. Chinese Mission House, M. 2
38. Emanuel-EI, M. 3
39. First Baptist, L. 4
40. First Congregational, M. 3
41. First Methodist, M. 2
42. First Unitarian, K. 4
43. Grace, M. 3
44. Jew House, M. 3
45. Mission Dolores, K. 7
46. St. Francis's, M. 2
47. St. Ignatius Church and Col., K. 5
48. St. Joseph's, L. 5
49. St. Mary's Cathedral, M. 2
50. St. Patrick, M. 3
51. Trinity, M. 3

PLACES OF AMUSEMENT.

40. Alcezar Theatre, M. 3
51. Alta Plaza, J. 3
52. Baldwin's Academy of Music, M. 4
53. Brush Street Theatre, M. 3
54. California Theatre, M. 3
55. Golden Gate Park, G. 6
56. Grand Opera House, N. 3
57. Standard Theatre, M. 3
58. Woodward's Gardens, K. 6

lady Jane Grey, was imprisoned in the Tower, from which, after 29 weeks, he escaped and fled to the continent, 1554; returned to England on the day of Elizabeth's coronation; was made bishop of Worcester, 1559; of London, 1570; and archbishop of York, 1576. He was a translator of the Bishop's Bible; and a commissioner to revise the liturgy. As preacher and bishop he was indefatigable and efficient.

SANDYS, Sir **EDWIN**, 1561-1629; educated at Oxford, where he was a pupil of Richard Hooker. He was knighted by James I., who gave him responsible employments. He was associated with Bacon in framing the "remonstrance" of 1604, and was a member and treasurer of the second Virginia company. It was largely due to his efforts that a charter was obtained for the Plymouth colony. His opposition to Charles I. caused him to be arrested in 1621. He wrote *Europa Speculum, or a View on Survey of the State of Religion in the Western part of the World* (1605).

SANDYS, **GEORGE**, 1577-1644; b. England; went to Oxford in 1589; traveled in the east, 1610-12, and published in 1615 an account of his travels in a work entitled *a Relation of a Journey in Four Books, containing a description of the Turkish Empire, of Egypt, of the Holy Land*, etc. In 1621 he removed to America, succeeding his brother as treasurer to the English colony of Virginia. He was much interested in the welfare of the colony, establishing iron-works and introducing ship-building. The Virginia company broke up in 1624, and he returned to England. He published translations of Ovid's *Metamorphoses*, the first translation of a classic to appear in America; also poetical versions of the *Psalms*, *Job*, *Ecclesiastes*, etc.

SAN FELÉ, a t. of south Italy, in the province of Potenza, 17 m. n.w. of Potenza. Pop. '81, 9704.

SAN FELIPE DE ACONCA'GUA, a t. of Chile, capital of the department of Aconcagua, 55 m.e. n.e. of Valparaiso. It is regularly built, and has a handsome appearance. In the vicinity are copper mines. Pop. '85, 11,768.

SAN FELIPE DE JATIVA. See **JATIVA**.

SAN FERNANDO (formerly *Isla de Leon*), a fortified city in the province of Cadiz, Spain, on the island Leon made by the St. Petri canal, which is crossed by two bridges. S. F. has salt works and an observatory, hospital and barracks. Pop. '87, 29,287.

SAN FILIPPO D'ARGIRO, a t. in e. Sicily, the site of the ancient Agryrium, named in honor of prince Agryris; birthplace of Diodorus Siculus. It is on the w. bank of the Traina, one of the head streams of the Giaretta; pop. about 13,000. It is 27 m. n.w. of Catania; has a Saracen castle and several churches and convents.

SAN FRANCISCO CO., Cal. See **SAN FRANCISCO CITY**.

SAN FRANCISCO, the most important city of California, and the commercial metropolis of the Pacific coast of North America, the eighth city in population in the United States, is at the north end of a peninsula 20 miles long, formed by the Bay of San Francisco and the ocean; in latitude 37° 8' 26" north, longitude 122° 24' 39" west. The first settlement in this locality was made by some Franciscan monks, who established a mission for the conversion of the Indians in 1769; and in 1776 a Spanish military post was founded here, under a grant from the king. The first tent of the modern city, however, was erected by an Englishman in Yerba Buena ("good herb"), three miles from the mission, in 1835; he at once started a trade in hides and tallow, and a village grew up at this point; in 1846 the mission and trading settlements were united under the present name, with a population less than 500. With the discovery of gold in 1848 emigrants and adventurers flocked to California from every quarter of the globe, and in 1850 there were 25,000 people in San Francisco. During 1849-51 several destructive fires occurred. The city was incorporated in 1850 and was consolidated with the county in 1856. The turbulent state of the community and the corrupt municipal government in 1851-56 compelled the law-abiding citizens to protect themselves by forming a Vigilance Committee, which summarily dealt with a number of public criminals and reduced the others to subordination.

San Francisco was originally built around the outside of a semi-circle of land extending into the bay, protected by Rincon Point on the south, 120 feet high, and Clark's Point on the north. The space between these two points, about one mile, is now entirely built up, many of the wharves and warehouses being supported by piles driven into the water. The consolidated city and county have an area of 42 square miles, and comprise, besides the city proper, Goat and Alcatraz islands, and Mission Rock in the bay, and the Farallones islands, twenty-four miles distant in the ocean. The main portion of the city lies on the eastern side of the peninsula, which at this point is six miles wide, but it is gradually extending over the hills, some of them rising to a height of 800 feet, towards the ocean. The mean altitude is 130 feet above the sea, and much labor and money have been expended since the city was settled to make it habitable, in leveling hills, filling up deep ravines, and reclaiming mud flats on the bay. The mean annual temperature in summer is 58.4°, and in winter is 50°, the variation from these points being very slight. Flowers bloom in the gardens at Christmas-time. Extreme changes are frequent, and fogs are common during the dry season; the average rainfall

during the wet season is about twenty-five inches. Earthquakes sometimes occur, although they are seldom destructive, and this has led to the use of wood largely in the construction of the houses ; but since the ravages by fire several times, marble, granite, and terra cotta have been greatly used for buildings, the interior frames being of iron and steel. The business portion is closely built, but the hilly section, where there are many elegant residences of wood, is more sparsely settled, and a peculiar sight is the cable cars crawling up the steep inclines to the outskirts. Belgian blocks and cobblestones are used in paving the business streets, but wood pavements with asphalt sidewalks are very common. Market Street forms the dividing line between the older and the newer portions of the city, and is the principal locality for retail stores. Montgomery is a wide, elegant thoroughfare and a fashionable promenade. The wholesale houses are chiefly in Front, Sansome, and Battery Streets ; the principal banks are in California, Montgomery, and Pine. Dupont and Stockton Streets, in the southern part of the city, are lined with handsome brick residences. There are no shade trees, but the yards around the better class of houses make a splendid show of flowers and evergreens, the natural sandy soil being overcome by artificial means. "Nob Hill," the portion of California Street lying between Powell and Leavenworth Streets, contains many of the largest private residences in San Francisco. No expense has been spared by these magnates of the Pacific Coast to make their homes luxurious, and some of them are marvels of elegance. From the top of Telegraph Hill may be obtained the best view of the Golden Gate, which is the narrow entrance to the harbor, the water-front of the City, the Bay, Mount Temalpais, and Mount Diablo.

Golden Gate Park, the largest in San Francisco, stretches from the city to the ocean, covering almost 1050 acres, and contains at the eastward end, where it is beautifully laid out, many varieties of trees—the eucalyptus, Monterey cypress, Monterey pine, etc. Along the ocean front, for a distance of two miles, the everlasting sand-dunes still remain, giving a charming variety to the landscape. There are monuments to President Garfield, Francis Scott Key (author of the "Star Spangled Banner"), General Halleck, and Thomas Star King (by D. C. French), erected in 1892, a fine conservatory and a Children's Playground. The Hill Park, a half mile from the eastern end of Golden Gate Park, commands fine views from its highest point, 570 feet above the ocean. The Presidio, or Government Military Reservation, has an area of 1500 acres, and stretches along the Golden Gate for about four miles. Many beautiful views may be obtained, the finest, perhaps, from Fort Point or Winfield Scott. It is garrisoned by two regiments, and a military band plays here nearly every afternoon. Another small military reservation is at Black Point, or San José, with Fort Mason. Not far from Golden Gate Park is Laurel Hill Cemetery, containing many fine monuments, and near it the celebrated Lone Mountain, cone-shaped, on the highest point of which is a large wooden cross. The *yerba buena*, or "wild mint," is found on Lone Mountain. "Chinatown" is one of the great curiosities of San Francisco. It lies within the limits of Kearney, Pacific, Stockton, and Sacramento streets, and consists mainly of tall tenement-houses, separated by narrow alleys, and swarming with Chinamen, very few women, and almost no children. They have theaters, joss-houses, opium-joints, and gambling-dens, all conducted in the Chinese fashion. The men are largely employed as house servants by the white residents.

Among the public buildings are the new City Hall, an elegant, original structure in Yerba Buena park, which cost \$5,000,000 ; the Merchants' exchange, Stock exchange, United States branch mint, California market, Mechanics' institute, Bank of California, First National bank, Mercantile library, Olympic club house, California Pioneers' building, Odd Fellows' hall, California academy of sciences, the Crocker and the Mills' building. Some churches worthy of mention are St. Patrick's, Grace, and Trinity, Calvary Presbyterian, Unitarian, Congregational, St. Mary's cathedral, and the synagogues of Emanu-El and Sherith Israel. The old Mission Dolores is one of the few interesting historical relics of San Francisco. It was built about 1778, of adobe, and the little churchyard near it is in a tangled, neglected condition. The Palace hotel is said to be one of the largest, as it is one of the most magnificent, buildings of the kind in the world. It occupies an area of 275 by 350 feet, is nine stories high, and has accommodations for 1200 guests. It was erected at a total cost of \$3,250,000. The Baldwin house, although smaller, is hardly inferior in its appointments, and other excellent hotels are the Occidental, the Lick house, and the California. The custom of living in hotels is very common, not only for single men, but for families. Places of amusement are numerous ; among them are Baldwin's and the California theater, Grand Opera house, Bush Street theater, the Alcazar, Tivoli Opera house, and the Chinese theaters. The Olympic Club grounds is a favorite place for athletic sports, and there are racing tracks in and adjoining Golden Gate park. Among the educational facilities of San Francisco are numerous free kindergartens, many graded schools, a boys' and a girls' high school, the Cogswell technical school, the medical, dental, and law departments of the university of California, the Cooper medical college, St. Ignatius' college, an academy of sciences, school of design, Pacific theological seminary, colleges of pharmacy and law, the James Lick school of mechanic arts, the Hopkins institute of art, Sacred Heart college, Irving institute, and, near the city, the university of California (Berkeley), and the Leland Stanford, Jr., university (Palo Alto). The public school property of the city is valued at over \$5,000,000. There are over 100 newspapers and periodicals, several of which are in the Chinese language. This city is the seat of a Roman

Catholic archbishop and a Protestant Episcopal bishop, and has nearly 200 churches, with church property valued at \$5,000,000. There are the city and co., St. Luke's, St. Mary's, and French and German hospitals, state woman's hospital, U. S. marine hospital, children's hospital, the new state asylum for the deaf, dumb, and blind, Alameda asylum for the insane, and Protestant and Roman Catholic orphan asylums.

San Francisco is the great financial center of the Pacific coast. The United States branch mint, established here, is one of the most important in the country. Many of the mines of California, Nevada, Colorado, Wyoming, and Arizona are owned by citizens of San Francisco. The U. S. census in 1890 reported for San Francisco 4059 manufacturing establishments, employing \$74,834,301 capital and 48,446 persons, paying \$30,979,374 for wages and \$78,656,470 for materials, and having a combined output valued at \$135,625,754. The principal plants are shipbuilding, sugar refining, iron and steel work, boot and shoe factories, breweries, coffee, spice, and chocolate works, cigar factories, wool scouring, leather tanning, fruit canning, etc. Besides these are manufactures of silk and woolen goods, carriages, glass, doors, cordage, willow-ware, etc.

San Francisco bay, fifty miles long and five miles wide, forms one of the grandest harbors in the world, and the principal one on the Pacific coast. It is landlocked by mountain ranges and traversed by craft from every quarter of the globe. Numerous ferry-boats and sailing vessels pass from one side to the other, immense ocean steamships run to China, the Hawaiian Islands, Japan, Australia, and Panama, and to domestic ports on the Pacific coast; huge Chinese junks, and the queer little feluccas of the Maltese and Greek fishermen, and the magnificent war-ships of the United States, all crowd this harbor, making it and the city among the most cosmopolitan in the world. At Hunter's Point, four and one-half miles distant, is a dry dock, cut out of the solid rock, 450 feet long, said to be one of the best on the globe, and at the shipyard of the Union Works is a hydraulic dock, with a platform 450 feet by 66 feet, lifted by thirty-three cylinders, supported by seventy-two piers. This city has an immense foreign trade, principally with the Hawaiian islands, Japan, China, Central America, and Great Britain. In the fiscal year 1896-7 the imports of merchandise aggregated in value \$34,375,945, of gold and silver coin and bullion, \$11,710,625; and exports of merchandise, \$39,647,606, of coin and bullion, \$10,543,078. Besides this, large amounts of canned fish and fruits, honey, borax, and ores, wines, sugar, tea, and wool are shipped by sea and sent east by rail. Easy access is had to the suburbs of San Francisco by the numerous ferries. At Cliff Point are the famous Seal Rocks, where hundreds of huge sea-lions bask in the sun or tumble in the ocean. A very successful mid-winter Exposition was held in San Francisco in 1894. Railroad connection is made with all parts of the country by the California and Nevada, the North Pacific Coast, the San Francisco and North Pacific, the Southern Pacific, and the South Pacific Coast lines, and their numerous branches. The city has gas and electric lights, electric and cable street railroads, excellent drainage, and waterworks supplied from mountain streams by gravity and from Lobos creek and lake Merced by pumping to reservoirs, the whole system having a combined storage capacity of over 65,000,000,000 gallons. Pop. '90, 298,997.

SAN FRANCISCO BAY, in n.w. California, a considerable body of water lying principally between the counties of Contra Costa, Alameda, Santa Clara, San Mateo, and Marin, receiving the drainage of the Sierra Nevada, and the great California valley, which, conducted by the Sacramento and San Joaquin rivers, flows into it through San Pablo bay, with an outlet to the Pacific ocean, at the city of San Francisco, through a channel called the Golden Gate. The channel is $1\frac{1}{2}$ m. wide and $2\frac{3}{4}$ m. long, with shores which are bold and rocky, nearly 2000 ft. high on the n., and on the s. shining white sand-hills from 300 to 400 ft. high. In the harbor there is great depth and excellent anchorage, and on the bar at the entrance there is 30 ft. of water at low tide. It contains several islands, Alcatraz, in the middle of the channel 4 m. from the entrance, Angel island, containing 800 acres, the largest one of all, and Yerba Buena, or Goat island. Alcatraz is fortified, and on the s. side of the Golden Gate is Fort Point.

SAN FRANCISCO MOUNTAIN, the highest summit in Arizona, 12,561 ft. above the sea, stands alone on the Colorado plateau, from which it rises abruptly 5000 ft., forming a land-mark seen from afar in all directions. Its base is 10 m. in diameter, and from its summit a hundred volcanoes may be seen.

SANGAMON, a co. in central Illinois; 860 sq. m.; pop. '90, 61,195, of American birth. Co. seat, Springfield, the capital of the state.

SANGAREE', a West Indian beverage, consisting of Madeira wine, syrup, water, and nutmeg.

SANGIR ISLANDS lie to the n. of Celebes, in 2° to 4° n. lat., are upwards of 50 in number, of various sizes, and nearly all inhabited. Pop. '88, 76,387. The three largest islands, Great Sangir, Sjauw, and Tagolandang, with those which surround each, form, as it were, separate groups. In the Sangir islands are many mountains, which, except the volcanoes, are clothed to their summits with a rich vegetation. Great Sangir has an area of 347 sq. m., and is divided into four kingdoms. The usual anchorage is on the w. side, in $3^{\circ} 28'$ n. lat. and $125^{\circ} 44'$ e. long. Pop. 45,000. In the n.w. is a volcano

called Abu, or the "Ash mountain," which has frequently caused great devastation. In May, 1856, the streams of lava and boiling water carried away the rich plantations, and 1200 lives were lost.

In all the islands, the areng (*saguerus* or *borassus gomutus*), the sago, cocoa-nut, and the finest sorts of timber trees abound. Maize, rice, katjang (a species of bean), tobacco, cocoa, and the sugar-cane are cultivated.

The Sangirese belong to the Malay race, are well made and brave, but cunning, lazy, and dirty in their habits.

SANG-KOI. See TONQUIN.

SANGRAAL. See GRAAL.

SANGRE DE CRISTO. A range of the Rocky mountains in Colorado; the highest peak, Blanca Peak, is 14,463 ft.

SANGRO, a river of Italy, which, flowing e.n.e., enters the Adriatic in lat. 42° 15' n. Its length is about 59 m.

SANGSTER, MARGARET ELIZABETH (née MUNSON), b. New Rochelle, N. Y., 1838. She married Mr. George Sangster in 1858. She has contributed largely, both in prose and verse, to periodical literature, especially the religious press, and has for many years been editor of the home department of the New York *Christian Intelligencer*. A well-known poem of hers, *Are the Children at Home?* has found its way into all the principal anthologies. Her book, *Talks with Girls*, had a large sale in this country and England. She has published also *With my Neighbors* (1896) and *Easter Bells*, poems (1897).

SANGUINARIA, a genus of plants of the natural order *papaveraceæ*, having 8 to 12 petals, 2 stigmas, an oblong swollen capsule with two deciduous valves, and a persistent, many-seeded frame. *S. Canadensis*, the BLOOD-ROOT or PUCCOON of North America, has a fleshy root-stalk abounding in a red juice, which abounds also in the leaf-stalks; and solitary radical leaves, which are roundish, deeply heart-shaped, and with about seven toothed angles. The flowers are solitary and spring from the root, on short stalks. The whole plant is acrid and narcotic, emetic and purgative in large doses; and in small doses stimulant, diaphoretic, and expectorant. It is much used as a medicine in the United States.—It is supposed to owe its properties to a peculiar alkaloid called *sanguinarine*, which is obtained from it as a white pearly substance. The large white flowers appear early in spring, and are a frequent ornament of flower-borders.

SANGUINE, or MURREY, one of the tinctures of less frequent occurrence in heraldry, denoting blood color, and represented in engraving by lines crossing each other saltireways.

SANGUISORBA/CEÆ, or SANGUISOR/BEÆ, according to some botanists a natural order of plants, but more generally regarded as a suborder of ROSACEÆ (q.v.). As a suborder, its distinctive characters are apetalous flowers—the tube of the calyx thickened, indurated, and lined with a disk, generally few stamens, and a solitary carpel, which ripens into a nut inclosed in the calycine tube. About 150 species are known, all of which are herbaceous or half shrubby, some of them spiny.—The leaves of *acaena sanguisorba*, a native of Van Diemen's land, are said to be an excellent substitute for tea. Of American species, burnet (q.v.), is among the best-known.

SANHEDRIM (Gr. *synedrion*), the supreme national tribunal of the Jews, established at the time of the Maccabees, probably under John Hyrcan. It consisted of 71 members, and was presided over by the nasi (prince), at whose side stood the ab-beth-din (father of the tribunal). Its members belonged to the different classes of society: there were priests (*archiereis*); elders, that is, heads of families, men of age and experience (*presbyteroi*); scribes, or doctors of the law (*grammateis*); and others, exalted by eminent learning—the sole condition for admission into this assembly. The presidentship was conferred on the high-priest in preference, if he happened to possess the requisite qualities of eminence; otherwise "he who excels all others in wisdom," was appointed, irrespective of his station. The limits of its jurisdiction are not known with certainty; but there is no doubt that the supreme decision over life and death, the ordeal of a suspected wife, and the like criminal matters, were exclusively in its hands. Besides this, however, the regulation of the sacred times and seasons, and many matters connected with the *cultus* in general, except the sacerdotal part, which was regulated by a special court of priests, were vested in it. It fixed the beginnings of the new moons; intercalated the years, when necessary; watched over the purity of the priestly families, by carefully examining the pedigrees of those priests born out of Palestine, so that none born from a suspicious or ill-famed mother should be admitted to the sacred service; and the like. By degrees the whole internal administration of the commonwealth was vested in this body, and it became necessary to establish minor courts, similarly composed, all over the country, and Jerusalem itself. Thus we hear of two inferior tribunals at Jerusalem, each consisting of 23 men, and others consisting of three men only. These courts of 23 men (lesser synedrion), however, as well as those of the three men, about both of which Josephus is silent, probably represent only smaller or larger committees chosen from the general body. Excluded from the office of judge were those born in adultery; men

born of non-Israelitish parents; gamblers; usurers; those who sold fruit grown in the Sabbatical year; and, in single cases, near relatives. All these were also not admitted as witnesses. Two scribes were always present, one registering the condemnatory, the other the exculpatory votes. The mode of procedure was exceedingly complicated; and such was the caution of the court, especially in matters of life and death, that capital punishment was pronounced in the rarest instances only. The nasi had the supreme direction of the court, and convoked it when necessary. He sat at the head, and to his right hand was the seat of the ab-beth-din; the rest of the 71 took their places according to their dignity, in front of them, in form of a semicircle, so that they could be seen by both the chief officers. The lictors, or "sheriffs," were always present at the session. The court met on extraordinary occasions in the house of the high-priest; its general place of assembly, however, was a certain hall (*lishcat hagazit*), probably situated at the s.e. corner of one of the courts of the temple. With exception of Sabbath and feast days, it met daily. The political troubles forced the sanhedrim (70 B.C.) to change its abode, which was first transferred to certain bazaars (*hannyoth*) at the foot of the temple mount. After the destruction of the temple and Jerusalem, it finally established itself, after many further emigrations, in Babylon.

We cannot here enter into that most difficult question as to the origin and development of the sanhedrim, and how far it was intended primarily to be a faithful reproduction of the Mosaic assembly of the 70 (Moses himself making 71), supposed to have been re-established by Ezra after the exile; any more than we can examine in this place into the widely different opinions respecting the jurisdiction and competence of the sanhedrim at the time of Christ and the apostles; how far, in fact, it may be said to have existed at all—save for a few matters of smallest importance—curtailed and circumscribed as it was by the Romans, who seem to have recognized only the "high-priest;" and that collateral but most vital question, whether it was the sanhedrim at all from whom emanated those well-known acts recorded in the New Testament. There can be no question as to its utter incompetence to arraign Christ for a "crimen læsæ majestatis," i.e., for high treason against the Roman emperor. No less difficult is the explanation of many of the proceedings against the apostles ascribed to this body. The suggestion that the word synedion, as used in the New Testament, stands only for an arbitrarily convoked "lynch-tribunal," deserves more consideration than it has hitherto received.

SANHITĀ is the name of that portion of the Vedas which contains the mantras or hymns. See VEDA.

SANILAC, a co. in e. Michigan, lying on lake Huron; drained by Black and Cass rivers; 960 sq. m.; pop. '90, 32,589, chiefly of American birth. The surface is rolling and broken, and the soil only moderately fertile; wheat, oats, hay, wool, butter, and maple sugar are the staples; lumber is the chief article of export. There are several manufactories of furniture and of carriages, and 4 flouring-mills. Co. seat, Sauliac Center.

SANITARY COMMISSION, UNITED STATES, an organization created from among the people of the northern states during the war with the South, which supplemented the medical service of the union army. Its duties and labors comprehended the choice and inspection of camps; the transportation of the wounded from the field of battle and their proper hospital accommodation and treatment; the supply of medical and general stores; the formation of convalescent camps; the organization of relief corps to proceed wherever needed and perform whatever sanitary or other helpful service was required; the special inspection of hospitals by skilled surgeons and physicians; and the establishment of a bureau of vital statistics, whose reports and investigations have added more to the existing knowledge on the subject of the sanitary conditions of warfare than was ever before published. A hospital directory contained the names of 600,000 men who passed through the military hospitals, and successfully answered 70 per cent of all inquiries made after battles, or for missing friends or relatives. Soldiers' homes, established by the commission, afforded food and shelter to as many as 2,000 soldiers per day during the four years of the war. At as many as 600 out of the 700 battles and skirmishes of the war, the commission was represented by its agents and its benefits. More than 4,500,000 meals and 1,000,000 nights' lodgings were supplied by this organization; and \$2,500,000 were collected by it of soldiers' pay. The quantity of stores supplied to the soldiers after the battle of Gettysburg is almost incredible, and the details far too numerous for statement here. The first call for funds by the commission was made June 21, 1861; and up to Mar. 28, 1862, but little more than \$50,000 had been contributed, mostly from Boston, New York, and Philadelphia. In Sept., 1862, its entire receipts had reached the sum of \$158,501. The magnificent gift by the state of California of \$100,000, made in the month last named, secured the commission from failure; and being followed within two weeks by another donation from California of the same amount, incited others to generous giving, and thenceforth there was no lack of money. Early in 1864 a series of "sanitary fairs" was undertaken in the chief cities and towns throughout the north, and these brought enormous sums to the treasury of the sanitary commission.

The following table shows the money contribution to the U. S. Sanitary Commission from all sources. June 27, 1861, to Jan. 1, 1866.

Maine.....	\$24,948 43	Canada.....	\$441 48
New Hampshire.....	21,926 84	Newfoundland.....	150 00
Vermont.....	3,521 17	Italy.....	50 00
Massachusetts.....	15,532 00	Turkey.....	50 00
Massachusetts, Boston branch.....	106,396 60	China.....	2,989 90
Rhode Island.....	11,823 96	Japan.....	5,000 00
Connecticut.....	8,418 55	United States Army.....	1,738 30
New England—general.....	6,683 75	United States Navy.....	199 00
New York.....	229,338 71	Boston and New England Fair.....	50,000 00
New Jersey.....	20,741 25	Yonkers, N. Y.....	12,000 00
Pennsylvania.....	12,736 77	Flushing, L. I., Fair.....	3,934 32
Delaware.....	775 00	Brooklyn and Long Island Fair.....	305,513 83
Maryland.....	5,913 95	Schuyler Co., N. Y., Fair.....	1,287 43
District of Columbia.....	12,124 53	Albany, N. Y., Fair.....	80,000 00
Virginia.....	703 60	Metropolitan, New York, Fair.....	1,184,487 72
Ohio.....	16,049 50	Warwick, N. Y., Fair.....	1,432 73
Indiana.....	1,264 15	Poughkeepsie, N. Y., Fair.....	16,192 27
Illinois.....	4,342 50	Hornellsville, N. Y., Fair.....	800 00
Michigan.....	691 30	South Adams, N. Y., Fair.....	3,087 04
Wisconsin.....	916 00	Baltimore Fair.....	40,234 54
Iowa.....	13 50	Wheeling, Va., Fair.....	2,500 00
Minnesota.....	67 85	Great Central Fair, Phila.....	1,035,398 96
Kentucky.....	6,608 05	Unknown sources.....	3,952 26
Louisiana.....	3,177 25	Interest on United States Certificates.....	37,771 71
North Carolina.....	8 00	Interest on deposits.....	1,923 63
California.....	1,233,977 81	Interest on deposits.....	3,154 15
Nevada.....	107,642 96	Receipts from <i>Sanitary Bulletin</i>	2,351 80
Oregon.....	79,406 94	Contributions to Medical Fund.....	197 00
Washington Territory.....	20,918 92	Proceeds from sales, furniture, etc.....	72,298 07
Idaho Territory.....	5,301 31	England.....	11,145 33
Colorado Territory.....	1,025 00	Scotland.....	74 75
Nebraska Territory.....	10 50	France.....	3,550 00
Vancouver's Island.....	2,195 61	European branch (Paris).....	13,372 72
Sandwich Islands.....	17,955 51	London branch.....	36,790 42
Chili.....	5,376 79	Belgium.....	100 00
Peru.....	2,002 00	Germany.....	843 22
Buenos Ayres.....	18,412 85		
Cuba.....	23 00		
Costa Rica.....	84 00	Total.....	\$4,924,480 99

After the war the entire collection of records, documents, correspondence, and other papers of the U. S. sanitary commission were deposited in the Astor library, New York; and some years later were formally placed in the possession of that institution, where they remain. The board of direction of the sanitary commission comprised the following gentlemen named by the medical bureau and the secretary of war: Rev. Dr. Henry W. Bellows, Prof. Alexander D. Bache, Prof. Wolcott Gibbs, Dr. Jeffries Wyman, Dr. W. H. Van Buren, Dr. Samuel G. Howe, R. C. Wood, surgeon U. S. A.; G. W. Cullum, U. S. A.; A. E. Shiras, U. S. A. Mr. Fred. Law Olmsted filled the position of general secretary of the commission during the first two years of its history, and to his judgment, sagacity, and administrative ability may be fairly attributed much of its success.

SANITARY SCIENCE, comprising Hygiene (q.v.) and Preventive Medicine, is comprehensively defined as the science of preserving the health, and the practical application of the laws of sanitation. The special subjects into which it may be subdivided and the principal topics with which it has to deal are:

(1) Those which concern the surroundings of man, such as meteorological conditions; the site or soil on which his dwelling is placed; the character, materials, and arrangements of his dwelling; the air he breathes; the cleansing of his dwelling; and the arrangements for the removal from it of excreta and other waste.

(2) The prevention of disease, and the disposal of the dead.

(3) The personal care of health, covering such points as diet, exercise, and clothing.

Taking up these topics in the order here indicated, we may proceed to the discussion of the subject.

1. **METEOROLOGICAL OR CLIMATIC CONDITIONS.**—Here temperature and humidity are the two points that obviously present themselves for consideration, but it is very difficult, indeed, to separate their influence from those of soil or site. It is also certain that much has been attributed to climate that is really due to other causes. It may be laid down as a general principle that, if moderate care be taken, man may preserve his health in almost any part of the world, although it must be admitted that in some places, such as hot and moist climates, disease causes appear to be more easily called into action than under colder or drier conditions. Some diseases, such as yellow fever, appear to require a certain temperature for their development and propagation; others, such as enteric (commonly called "typhoid") fever, appear to exist indiscriminately under any meteorological conditions; others, such as cholera, although undoubtedly originating in hot and moist countries, appear capable of being propagated in most parts of the world. In some cases great heat and dryness arrest disease, as used to be observed in Egypt, where the plague was commonly said to cease after St. John's day. During the hot wind of the west coast of Africa, small-pox is arrested, and successful vaccination becomes impossible. To the sick or delicate, meteorological conditions are of great importance, but this part of the subject belongs more to the treatment of disease than to general hygiene. To the healthy, meteorological conditions, however much

they may affect personal comfort, are of comparatively little moment as regards health, so long as reasonable care is observed. In a healthy body an adaptation to circumstances rapidly takes place, and an equilibrium is soon established. Thus, it used to be supposed that great heat increased the temperature of the body, but later observations have shown this to be erroneous, and that the balance is soon re-established by the process of transpiration; should this, however, be arrested, then a rise of temperature may take place, and disease of a febrile character be established.

THE SOIL OR SITE OF THE DWELLING is, however, of greater moment, and much that has been attributed to climate has been more truly due to locality. Soils are generally divided into moist and dry, permeable and impermeable, and again subdivided according to formation, composition, slope, etc. Healthy soils are those which are dry and permeable, or which have such a slope as renders drainage easy; on the other hand, soils which are flat, moist, and impermeable are generally unhealthy. Soils containing much organic matter are to be avoided, such as alluvial soils generally, as well as all marshy districts. The air in soils is generally more or less impure, hence the unadvisability of occupying dwellings below the ground level or situated immediately on its surface. The water in the soil is a question of great importance, apart from the mere moisture. At varying distances from the surface, but everywhere, there exists a great subterranean lake or sea, known as the ground-water or water-table, which is constantly in motion, both vertically and horizontally. Its horizontal movement is toward the nearest water-course or toward the sea; its vertical movement is determined by rainfall chiefly. Much importance has been attached to it, and the following points may be considered as accepted by most hygienists: (1) a permanently high ground-water—that is, within 5 feet of the surface—is bad, while a permanently low ground-water—that is, more than 15 feet from the surface—is good; and (2) violent fluctuations are bad, even with an average low ground-water; a comparatively high ground-water with moderate and slow fluctuations may be healthy. According to the school of Pettenkofer, it is the ground-water which determines the spread of certain forms of disease, such as cholera and enteric fever. A previously high level, succeeded by a fall, with a certain height of temperature in the soil-air, is the condition believed by them to be the one most favorable for disease production. Healthy soils are the granites, metamorphic rocks, clay slate, limestone, sandstone, chalk, gravel, and sand; unhealthy are clay, sand and gravel with clay subsoil, alluvial soil, and marsh-lands, with the exception of peatlands. Among the unhealthy soils ought also to be included all “made” soils, particularly those that are formed so often in towns from rubbish of all sorts. Such soils ought not to be occupied as building sites for at least two years.

THE SANITATION OF DWELLINGS involves numerous points. The site has been considered in the previous section, but the importance of excluding soil emanations must be insisted upon. The placing of a dwelling in any spot of ground tends to exert an extractive force upon the soil, because the air of the dwelling is almost always warmer than the external air, and there is therefore a constant danger of sucking up the more or less impure soil-air into the dwelling. Not only is this a recognized source of disease, but fatal cases of direct poisoning have sometimes resulted, as when coal-gas has escaped into the soil below or near a dwelling. An impervious foundation is therefore necessary, although this precaution is too often neglected, even in high-class dwellings. Houses ought to be so arranged that they may receive plenty of light, not merely for work or convenience, but as a matter of health. Sunlight, for full health, is as necessary as air, and this is now so strongly recognized in America that in many of the hospitals in this country rooms are provided where patients may take a “sun-bath.”

THE MATERIALS of which houses are built are various. Wooden dwellings have advantages, but there is always the danger of fire. Brick or stone is most commonly used, but very good dwellings may be made of concrete, or even of mud. Probably the best material is good, sound, well-burnt brick. Dryness must be secured by means of damp-proof courses along the foundations, hollow walls, and cementing or slate-hanging externally. Non-absorbent surfaces internally are important, although some writers, such as Pettenkofer, etc., have been inclined to attribute the unhealthiness of dwellings to the impermeability of the walls obstructing air change. But where air can pass, organic matter can lodge and becomes a source of danger. It is better, therefore, to have non-absorbent surfaces as much as possible, and to provide for ventilation in other ways. Paint that can be washed is therefore better than paper; if the latter is used it had better be glazed. Care should be taken to scrape off all old papers beneath, as they and the paste used with them tend to decompose and become injurious to health. Ceilings ought to be impervious as well as walls, and floors ought to be made of well-fitting seasoned wood, caulked, and oiled or varnished so as to make them water-tight.

PROPER CUBIC SPACE is a matter of great importance, for upon it depends the renewal of air. The air of an air-space can seldom be changed oftener than three times an hour, hence the space ought to be large enough to allow of such rate of change providing enough of air for respiratory purposes. The furniture of rooms, especially sleeping rooms, ought not to be too massive; while curtains and hangings too often form traps for dust and organic matter.

THE WARMING of houses is important, and is generally badly and wastefully done. The open fire-place has great advantages, but it is in many cases insufficient. Where

any general system is employed it is better to warm the air in the room itself, as by pipes conveying hot water or steam, than to warm it before delivery. Overheated rooms are a source of ill-health. For sitting-rooms 60° to 65° is quite enough; for a study or work-room 60° is sufficient, even in some cases less than this. A sleeping room need never be above 60° , often with advantage below it. Fresh air ought not to be sacrificed to temperature, except under extreme circumstances. Dwellings should not be occupied for some time after building, till they are thoroughly dry. Rheumatism, chest diseases, etc., are very apt to arise from neglect of this precaution. See WARMING.

Scrupulous attention to cleanliness is necessary in dwellings, and there is wisdom in their periodical vacation for a certain time, so as to let them lie fallow, as it were, and interrupt the continuity of deposit of organic matter. Dwellings ought to be scattered over as wide an area as possible, for statistics show that sickness and death-rate are often inversely proportional to the amount of area per head occupied by a community. The area per head in London is estimated at double that of Paris and many other cities, while at the same time its death-rate is smaller than that of any other large city in Europe.

AIR is the prime necessity of life. Food or water may be abstained from for a considerable time, and we may thus have an opportunity of replacing either should we doubt its purity or wholesomeness, but the atmosphere around us we must breathe or die. Hence the paramount necessity for having it pure. But, although this is apparently so obvious, attention to its importance has been very generally omitted. Air consists of a mechanical mixture of oxygen and nitrogen, in the proportion of nearly 21 per cent. of the former to 79 of the latter, with small quantities in addition of carbonic acid, moisture, organic matter, etc. By respiration and combustion air becomes vitiated, the oxygen diminishing and the carbonic acid and organic and suspended matter increasing. Within certain limits, the amount of carbonic acid is in itself immaterial to health, but it is important as a measure of the amount of organic matter, which is really the dangerous impurity. Air vitiated by respiration is also much more dangerous than when the carbonic acid is partly the result of combustion. It is now pretty generally admitted that air cannot be considered as really good and fit for respiration in which the respiratory impurity reckoned as carbonic acid much exceeds two parts in 10,000 by volume. On the other hand, if air can be kept down to this point the condition may be looked upon as satisfactory. The amount of impurity given off by living beings varies, of course, with size, weight, age, sex, and work, but it may be allowed that under ordinary circumstances it amounts to about six cubic feet of carbonic acid per head in ten hours during repose. This requires an hourly supply per head of 3000 cubic feet of fresh air for its dilution, and this amount should be largely increased during work or in sickness (see HOSPITALS). The diseases which have been shown to arise from the effects of the vitiated air are widely prevalent, including such as consumption and other forms of scrofulous disorders, bronchitis and pneumonia, sore throat, etc. Crowded and ill-ventilated places also tend to increase the virulence and the rapidity of spread of the various communicable diseases. See ATMOSPHERE.

CLEANSING, including the removal of slops, excreta, etc., forms one of the most important and also most difficult of questions. The main principle is that all should be immediately and effectually removed from the house and its neighborhood, and that there should be no possibility of reflux of foul air from drain or cesspool. The system of water-carriage is certainly the cleanest and most convenient, especially among large communities, but other systems find advocates. In villages and isolated houses the earth system and other dry methods have many advantages. The question of the disposal of sewage is a very large one, into which it is impossible to enter here. Hitherto all, or almost all, the material has been wasted by being poured into rivers or the sea, the streams being thus polluted and the shores rendered offensive. The object to be aimed at is to utilize a product of undoubted fertilizing influence, without endangering the health of the community. The diseases to be apprehended from imperfect methods of sewage removal are enteric fever, cholera, diphtheria, sore throat, and an aggravation of most other diseases, especially those of an eruptive character. Ashpits ought to be especially attended to, their neglect being attended with much danger.

The matter to be dealt with may conveniently be classified as made up of four parts: (1) dust, ashes, kitchen waste, and solid matters generally, other than solid excreta; (2) excreta, consisting of urine and feces; (3) slop-water, or the discharge from sinks, basins, baths, etc., and the waste water of industrial processes; (4) surface water due to rainfall. Before the use of underground conduits became general, the third and fourth constituents were commonly allowed to sink into the neighboring ground, or to find their way by surface channels to a watercourse or to the sea. The first and second constituents were conserved in middens or pits, either together or separately, and were carried away from time to time to be applied as manure to the land. In more modern times the pits in which excrement was collected took the form of covered tanks called cesspools, and with this modification the primitive system of conservancy, with occasional removal by carts, is still to be found in many towns. Even where the plan of removing excrement by sewers has been adopted, the first kind of refuse named above is still treated by collecting it in pails or bins, whose contents are removed by carts either daily or at longer intervals. It therefore forms no part of the nearly liquid sewage which the other constituents unite to form.

The second constituent is, from an agricultural point of view, the most valuable, and from a hygienic point of view the most dangerous, element of sewage. Even healthy excreta decompose, if kept for a short time after they are produced, and give rise to noxious gases; but a more serious danger proceeds from the fact that in certain cases of sickness these products are charged with specific germs of disease. Speedy removal or destruction of excremental sewage is, therefore, imperative. It may be removed in an unmixed state, either in pails or tanks, or (with the aid of pneumatic pressure) by pipes; or it may be defecated by mixture with dry earth or ashes; or, finally, it may be conveyed away in sewers by gravitation, after the addition of a relatively large volume of water. This last mode of disposal is termed the water-carriage system of sewerage. It is the plan now usually adopted in towns which have a sufficient water supply, and it is probably the mode which best meets the needs of any large community. The sewers which carry the diluted excreta serve also to take slop-water, and may or may not be used to remove the surface water due to rainfall. The water-carriage system has the disadvantage that much of the agricultural value of sewage is lost by its dilution, while the volume of foul matter to be disposed of is greatly increased. But it has been found that, even when the excrement of a community is kept out of the sewers and subjected to distinct treatment, the contents of the sewers are still so foul that their discharge into streams is scarcely less objectionable than when the water-carriage system is adopted; and, further, it appears difficult, if not impossible, to realize the agricultural value of excrement by any process of separate treatment that is not offensive or dangerous, or inapplicable to towns.

When, in the water-carriage system, the same sewers carry foul sewage and surface-water due to rainfall, the sewerage is said to be "combined;" the "separate" system, on the other hand, is that in which a distinct set of sewers is provided to carry off rainfall. Each plan has its advantages. In the separate system the foul-water sewers need be large enough to take only the normal flow; they may thus be made self-cleansing much more readily than if their size were sufficient to carry the immensely greater volume to which (on the combined plan) sewage may be swollen during heavy rain. The amount of dangerously foul matter is also much reduced. On the other hand, the contents of the rain-water sewers are still too much tainted by the filth of the streets to render their discharge into rivers or lakes undesirable; and the complication of two sets of mains and branches is a serious drawback. Where old sewers are giving place to new ones it is not usual to retain the old sewers for the carriage of surface-water; but in new works a single system of sewers, provided with storm-overflows to relieve them of part of the rainfall during exceptionally heavy showers, would probably be preferred in nearly every case. Since sewers should, in all cases, be water-tight, they do not form suitable collectors of subsoil water.

The water-carriage system of sewerage will be noticed here under its three aspects: (1) the ultimate disposal of sewage; (2) the system of common sewers by which sewage is conveyed to its destination; (3) the domestic arrangements for the collection of sewage.

The Ultimate Disposal of Water-carried Sewage.—In the water-carriage system of sewerage the fertilizing elements are so largely diluted that it becomes a matter of the utmost difficulty to turn them to profitable account. It has been estimated that every ton of London sewage contains ingredients whose value as manure is rather more than 2*d*, a value which, could it be realized, would make the sewage of the metropolis worth a million and three quarters sterling per annum. Sewage farming, however, does not pay. After much costly experiment the conviction is gaining ground that neither by applying sewage directly to land, nor by any process of chemical treatment that has yet been proposed, can sewage be made to yield a return as manure which will cover the cost of its transport, treatment, and distribution, except perhaps in a few cases where the circumstances are peculiarly favorable.

Five methods of treating sewage may be named, of which two or more are often found in combination.

Discharge into the sea or into a large watercourse is in general the least costly means by which a community can rid itself of its sewage. Much care in the choice of outlets is necessary to make this plan effective in avoiding nuisance. Some towns make use of tanks or outlet-sewers of large capacity, from which the discharge is allowed to occur only when the tide is ebbing. When the volume of sewage is very large, even this precaution does not wholly protect the neighboring coasts from foul deposits. A striking instance is furnished by the case of London, which discharges its sewage into the tidal estuary of the Thames at Barking and Crossness during only some three or four hours from the time of each high tide. It is found that the discharged matter is washed up and down the river with every tide, and that the portion that is not deposited in the form of mud banks only very slowly works its way to the sea.

Broad Irrigation.—By this is meant the use of sewage to irrigate a comparatively large tract of cultivated land, in the proportion of about 1 acre (or more) of land to every 120 persons in the sewage-contributing population. This system is now largely and successfully used, especially where the soil is a porous sandy loam. Fears that the farms would prove dangerous to the health of the neighboring district, and that the crops and vegetables grown on them would be unwholesome, have proved groundless.

When the farm is properly laid out and carefully managed the effluent water is pure enough to be admitted to a clear stream from which water-supply is drawn. Broad irrigation is practised at many English towns; and it has recently been applied on a very large scale, to dispose of the sewage of Berlin.

Intermittent Downward Filtration.—This is another mode of purifying by applying it to land, which differs from broad irrigation in requiring a much smaller area in proportion to the sewage dealt with. In 1870, Dr. Frankland drew attention to the fact that if sewage were passed through porous soil, not continuously but at intervals long enough to let the soil become aerated, rapid purification took place through the oxidizing action of the air which the soil held in its pores. He estimated that an acre of suitable ground, well furnished with subsoil drains to remove the water after percolation, could in this way take the sewage of 2000 persons. This estimate is now considered excessive, and 1000 persons to the acre is a more recent limit. Mr. J. Bailey-Denton at once took up Dr. Frankland's suggestion, and in his hands the system of intermittent filtration through land has been successfully applied to the sewage of many towns. The land which constitutes the filter is used to grow vegetables and other crops. Clay soils are, as far as possible, avoided, and the land is thoroughly under-drained at a depth of about 6 feet. The sewage is distributed over the surface in open channels, the proper laying out of which is an important item in the cost of the system, but is essential to its success. When the number of persons exceeds 500 per acre it is advisable to precipitate the solid matter that is held in suspension before the liquid is applied to the land, in order to prevent the surface of the ground from becoming clogged with sewage sludge. Mr. Bailey-Denton has pointed out the advantage which the system of intermittent filtration offers as a supplement to broad irrigation, where that is carried out. A serious objection to the disposal of sewage by irrigation is the fact that the farmer must take the sewage always, at times when it hurts the land as well as at times when the land wants it. But by laying out a portion of the land as a filter bed the sewage may be thrown on that whenever its presence on the remainder would do harm rather than good. Mr. Denton has applied this combined system in several instances, and insists, apparently with much reason, that such a combination offers a better prospect of profit than any other efficient mode of purifying sewage.

Filtration through Artificial Filters of sand, gravel, ashes, charcoal, coke, peat, etc., though often experimented on, can scarcely be described as an actual system. It is attended by the difficulty that the filter becomes speedily choked by the deposit of sludge. The intermittent use of a suitable artificial filter will, however, serve efficiently to oxidize and therefore purify the liquid portion of sewage from which the sludge has been previously precipitated, and filtration through coke is used in some instances as a supplement to the process which is next to be described.

Chemical Treatment, or Precipitation.—When sewage is allowed to stand or to flow very slowly through a large tank, a gradual subsidence of the solid particles takes place. The subsidence is, however, much too slow to be complete before decomposition sets in. But it may be very greatly accelerated by the addition of certain reagents, with the object of producing a precipitate which, in falling, will carry down with it the minute particles of solid matter that are suspended throughout the mass. Lime is the substance most usually employed. It is introduced in the form of milk of lime, and in the proportion of about one ton of lime to one million gallons of sewage. When thoroughly mixed, the liquid is left at rest, and a rapid separation of the sewage follows, into a comparatively clear supernatant liquid and a glutinous precipitate or "sludge." The sludge has little value as manure, for the best agricultural constituents of sewage are contained in solution, and very little of the soluble matter is carried down in the deposit. The sludge is dried by being strained over beds of slag, pressed into blocks, for transport, and got rid of by being burnt or dug into the ground or thrown into the sea. It has been used in the manufacture of bricks and of cement, but in general it can be disposed of only at a loss. The clarified effluent still contains dissolved organic matter, and may be admitted into running streams only when a high standard of purity is not compulsory. When, however, the volume of the running water which it enters is relatively very large, a quick purification takes place by means of the oxygen which the water carries in solution.

The lime process is practised, without further purification of the effluent water, in England at Leeds and elsewhere. At Bradford, too, after precipitation by lime, the effluent is filtered through beds of coke-breeze. At Birmingham, the sewage of 600,000 people, after clarification by lime (which also serves to neutralize the acid contributed by manufactories), is used to irrigate a farm of 1200 acres.

Much difference of opinion still exists as to the relative merits of broad irrigation, filtration through land, and chemical treatment, as a means of disposing of sewage. That either of the two first plans or a combination of them both can be made to yield a satisfactory solution of the sewage problem, from a hygienic point of view, seems unquestionable. That chemical treatment, especially if supplemented by filtration through land, will also purify well, is generally admitted. No process of effective purification is now expected to yield a profit; but the question of cost, on which the choice of a system principally turns, is too extensive to be touched in this article.

The Conveyance of Sewage.—For small sewers, circular pipes of glazed earthenware

or fire-clay or of molded cement are used, from 6 inches to 18 inches and even 20 inches in diameter. The pipes are made in short lengths, and are usually jointed by passing the end or spigot of one into the socket or faucet of the next. Into the space between the spigot and faucet a ring of gasket or tarred hemp should be forced, and the rest of the space filled up with cement, not clay. The gasket prevents the cement from entering the pipe, and so obstructing the flow; at the same time it forms an elasting packing which serves to keep the successive lengths of pipe concentric, even if the cement should fail. The pipes are laid with the spigot ends pointing in the direction of the flow, with a uniform gradient, and, where practicable, in straight lines. In special positions, such as under the bed of a stream, cast-iron pipes are used for the conveyance of sewage. Where the capacity of an 18-inch circular pipe would be insufficient, built sewers are used in place of earthenware pipes. These are sometimes circular or oval, but more commonly of an egg-shaped section, the invert or lower side of the sewer being a curve of shorter radius than the arch or upper side. The advantage of this form lies in the fact that great variations in the volume of flow must be expected, and the egg-section presents for the small or dry-weather flow a narrower channel than would be presented by a circular sewer of the same total capacity.

Built sewers are most commonly made of bricks, moulded to suit the curved structure of which they are to form part. Separate invert blocks of glazed earthenware, terra-cotta, or fire-clay are often used in combination with brickwork. The bricks are laid over a templet made to the section of the sewer, and are grouted with cement. Concrete is now very largely used in the construction of sewers, either in combination with brickwork or alone. For this purpose the concrete consists of from 5 to 7 parts of sand and gravel or broken stone to 1 of Portland cement. It may be used as a cradle for or as a backing to a brick ring, or as the sole material of construction by running it into position round a mould which is removed when the concrete is sufficiently set, the inner surface of the sewer being in this case coated with a thin layer of cement.

In determining the dimensions of sewers, the amount of sewage proper may be taken as equal to the water supply (generally about 30 gallons per head per diem), and to this must be added an allowance for the surface water due to rainfall. The latter, which is generally by far the larger constituent, is to be estimated from the maximum rate of rainfall for the district and from the area and character of the surface. In the sewerage of Berlin, for example (one of the most recent instances of the combined water-carriage system applied on a large scale), the maximum rainfall allowed for is $\frac{7}{8}$ of an inch per hour, of which one-third is supposed to enter the sewers. In any estimate of the size of sewers based on rainfall account must, of course, be taken of the relief provided by storm-overflows, and also of the capacity of the sewers to become simply charged with water during the short time to which very heavy showers are invariably limited. Rainfall at the rate of 5 or 6 inches per hour has been known to occur for a few minutes, but it is altogether unnecessary to provide (even above storm-overflows) sewers capable of discharging any such amount as this; the time taken by sewers of more moderate size to fill would of itself prevent the discharge from them from reaching a condition of steady flow; and, apart from this, the risk of damage by such an exceptional fall would not warrant so great an initial expenditure. Engineers differ widely in their estimates of the allowance to be made for the discharge of surface water, and no rule can be laid down which would be of general application.

Domestic Sewerage.—In the water-carriage system each house has its own network of drain-pipes, soil-pipes, and waste-pipes, which lead from the basins, sinks, closets, and gullies within and about the house to the common sewer. These must be planned to remove sewage from the house and its precincts quickly and without leakage or deposit by the way; the air within them must be kept out of the dwelling, by placing a water-trap at every opening through which sewage is to enter the pipes, and by making all internal pipes gas-tight; the pipes must be freely ventilated by a current of fresh air, in order to oxidize any deposited filth and to dilute any noxious gas they may contain; finally—and this is of prime importance—the air of the common sewer must be rigorously shut out from all drains and pipes within the house. To disconnect the pipes of each individual house from the atmosphere of the common sewer is the first principle of sound domestic sanitation. When this is done the house is safe from contagion from without, so far as contagion can come through sewer gas; and, however faulty in other respects the internal fittings may be, the house can suffer no other risk than that which arises from its own sewage.

Protection against the passage of gas through openings which admit of the entry of water is secured by the familiar device known as the water-trap.

The simplest and in many respects the best form of trap is a bent pipe or inverted siphon, which is sealed by water lying in the bend. The amount of the seal varies in practice from about an inch to 3 inches. If the pressure of air within the pipe, below the trap, is greater than that of the air above the trap by an amount exceeding the pressure due to a column of water equal in height to the seal, the trap will be forced and air will bubble through. This is one way in which a trap may fail, but this may be prevented by sufficient ventilation of the pipe below the trap. Other possibilities of failure are, however, only too numerous. If the pipe is disused for some time, the water may evaporate so considerably as to break the seal. The pipe, if of lead, may

bend out of shape, or it may even be so badly set in the first instance as to make the trap inoperative. The seal may be broken by the capillary action of a thread or strip of cloth, hanging over the lip of the trap and causing the water to drain away. A rush of water down the pipe, suddenly arrested, may pass the trap with such momentum as to leave it wholly or partly empty. "One more imperfection in traps may be named. The experiments of Dr. Fergus have shown that the water in traps will allow gases to pass through by absorbing the gas on one surface and giving it off at the other. It is improbable that this action occurs to such an extent as to be dangerous by permitting the transfer of disease germs from one to the other side. Apart from any risk of this kind, however, it is clear that a trap is open to so many possibilities of failure as to form a very insufficient barrier between the air of a room and the foul air of a sewer. Nevertheless, the practice was until very lately almost universal, and is still far from uncommon, of connecting closets, sinks, and even bedroom basins with common sewers by a continuous system of piping, in which the only safeguard against the entry of sewer gas is a single trap close to each sink or basin. This means that sewer gas, charged with the infection of a whole community, is brought within a few inches of the atmosphere of the dwelling, ready to contaminate it whenever the trap fails from any of the causes which have been named, or whenever, by a flow of water through it, the seal is sufficiently disturbed to allow bubbles of gas to escape into the room. The remedy for this lies in having, at any convenient point on each house-drain, a disconnecting trap which separates the house system from the sewer, and so establishes what may be called an outer line of defense. Any accidental leakage of sewer gas through it then does no more than cause a comparatively slight pollution of the air within the house-drains, and if these are well ventilated the effects of this are insensible. At each individual basin or other fitting a trap is still required, but its function is now merely to shut out the air of the house-drains from the rooms, and as the air of the house-drains is no longer polluted by connection with the sewers, the occasional failure of this function is a matter of comparatively small moment. Further, the disconnecting trap on the house-drain furnishes a convenient place of access for fresh air; and the ventilation is completed by carrying the highest point of each soil-pipe or waste-pipe up to the level of the roof and leaving it open there." The soil-pipe is ventilated by a current of air which (usually, if not always) flows upwards. This not only dilutes any gases that are produced in the pipe, but quickly oxidizes any foul matter that may adhere to the sides. Care must be taken to avoid having the upper end of the pipe open near windows or under eaves. Sometimes, the branch leading to a water-closet is ventilated by a pipe carried into an upper part of the soil-pipe; this is scarcely necessary if the branch be short. Another construction is to carry a distinct ventilating pipe up from the top of the branch to a point above the roof; and where several fittings discharge into one soil-pipe, the same ventilating pipe may be made to serve for all.

By another arrangement of double disconnecting trap any sewer gas forcing the trap next the sewer is still kept back by the upper trap, and will escape by a grating or open ventilating shaft, while air to ventilate the house-drain enters the upper trap from the man-hole. This arrangement no doubt gives more absolute protection than a single trap of the kind already described, but it is probable that (except in cases where the sewers are very foul and liable to frequent excess of pressure) the advantage is so slight as to be more than counterbalanced by the greater liability to accidental stoppage and greater complexity which this arrangement entails.

The extent to which it is permissible or advisable in practice to allow several fittings to discharge into a single waste-pipe or soil-pipe will vary in different cases. We can recognize a broad distinction between sewage from closets and urinals, liable to the most dangerous taint should disease occur within the house, and comparatively innocuous sewage that comes from basins, baths, and sinks. Some sanitarians go so far as to advise that these two classes of sewage should be kept absolutely apart within the house, by the use of a complete system of house drain-pipes. This, however, is an extreme measure; no reasonable objection can be urged against the discharge into a water-closet soil-pipe of water from a bath or washhand basin in the same room, except perhaps that if the soil-pipe is of lead its corrosion is hastened by hot water; and the additional flushing which the soil-pipe so receives is a distinct advantage. But to connect a water-closet soil-pipe with sinks and basins in other apartments is to multiply possibilities for the spread of disease within the house, and it is strongly advisable to convey the waste from them by a separate pipe, protected from the sewer by a disconnecting trap of its own with a grating open to the air. This applies with special force to the wash-basins that are often fixed in bedrooms and dressing-rooms. Nothing could be more dangerous than the usage—of which many good houses still furnish instances—of multiplying these conveniences without regard to the risk they involve, and making this risk as great as possible by placing each in direct communication through an ordinary trap with the soil-pipe, itself perhaps unventilated and provided with no disconnection from the sewer. Even when the drain or soil-pipe is ventilated and disconnected from the sewer, no bedroom basin should, under any circumstances, be allowed to discharge into it without first passing a separate open trap. On the other hand, a bedroom basin may be made perfectly safe by leading its waste-pipe (trapped under the basin in the usual way) into an open-air channel which communicates with

the sewer by a surface-trap or gully outside the house. Similar treatment should be adopted in the case of pantry and scullery sinks. Under most plumbing fixtures it is usual to place a safe-tray to receive any water accidentally spilt. The discharge pipes from these trays are sometimes, but very objectionably, led into the waste-pipe or soil-pipe below the fixture. The proper method of providing for the discharge of water spilt into the safe-tray is to lead a pipe from it through the wall and allow it to end in the open air; a flap valve fixed on the end will serve, if need be, to keep out draught.

OVERFLOW-PIPES from cisterns used for dietetic purposes should be led, in the same way, into the open air and not into soil-pipes or waste-pipes. Traps on them cannot be depended on to remain sealed, and any connection of an overflow-pipe with a soil-pipe would result in allowing foul air from the pipe to diffuse itself over the surface of water in the cistern—a state of things peculiarly likely to cause pollution of the water. When a cistern is used only for water-closet service, its overflow-pipe may properly be led into the basin of the closet.

RAIN-PIPES, extending as they do to the roof, are sometimes used to serve as ventilating continuations of soil-pipes and waste-pipes. The practice is open to serious objection, for it discharges the drain air just under the eaves, at a place where air is generally being drawn into the house. The ventilating end of a soil-pipe should be carried to a higher level, clear of the lower edge of the roof. It is better to restrict rain-pipes to their legitimate function of taking surface water from the roof, or at most to allow them to receive slop-water from sinks and basins, and to make them terminate in or over open traps from which a connection is taken to the house-drain or sewer.

HOUSE-DRAINS—that is to say, those parts of the domestic system of drainage which extend from the soil-pipes and waste-pipes to the sewer, are made of glazed fire-clay pipes, generally 6 inches, but sometimes only 4 inches in diameter. A larger size than 6 inches is rarely if ever desirable. The pipes are spigot-and-faucet-jointed, and the joints should be made with cement in the manner already described for sewers. When, as is often unavoidable, the house-drain has to pass under a part of the house, or to come from back to front, iron pipes jointed with lead and coated with an anti-corrosive compound are preferred to fire-clay pipes, as giving a better security against the production of leaks by the settling of the soil and other causes. Soil-pipes, when carried down inside the house, are either of lead or iron; when outside the house they are usually of iron. An outside soil-pipe is obviously preferable to an inside one; if the arrangement of the building makes an inside soil-pipe necessary, care must be taken that it shall be easily accessible for inspection at all parts of its length. The usual diameter is 4 inches. For the sake of good ventilation it is desirable to continue the soil-pipe to a point above the roof without reduction of diameter rather than apply a smaller ventilating pipe. Amongst reasons for ventilation one remains to be mentioned—that, owing to the corrosive action of sewer gas, the life of the soil-pipe is greatly shortened if provision for the free circulation of air be wanting or insufficient. A closed soil-pipe becomes in time pitted with holes, especially in the upper parts of its length.

Defective joints in soil-pipes and waste-pipes, particularly where they connect with drains, closet-basins, sinks, etc., are another frequent cause of leakage. Any want of air-tightness in drains or soil-pipes within a dwelling leads to the pollution of the air, not merely by diffusion, but by an actual indraught, for generally the air of the house has its pressure reduced by chimney draughts to a value slightly lower than that of the air outside. The house, in fact, ventilates itself by drawing in the air from the pipe at any hole, a fact which may easily be demonstrated by holding the flame of a taper near the hole.

Various experimental methods are used of detecting such leaks as would admit foul air to the dwelling. Of these the best is the "smoke test." It consists of filling the house-drain, soil-pipes, and waste-pipes with a dense and pungent smoke, any escape of which into the house is readily observed by eye and nose. A quantity of cotton-waste soaked in oil is lighted, and its fumes are blown into the house-drain by a revolving fan, at the ventilating cover of the disconnecting trap, or at any other convenient opening. Smoke soon fills the pipes and begins to escape at the roof. The upper ends of the pipes are then closed, and the house is searched for smoke. Another test, especially applicable to those parts of drains that are laid under houses, is the hydraulic test, which consists in stopping up the lower end of the pipe, filling it with water so as to produce a moderate pressure, and then observing whether the level of the water falls. This test, however, is too severe for any but new and very well-constructed drains.

Every basin, sink, or other fitting should be separately trapped by a bend on the waste-pipe or some other form of trap. A brass cap, screwed on a ferule which is let into the pipe on the bend facilitates cleaning. The warm waste-water from pantry and scullery sinks contains much grease, and should be discharged into a grease box, where the water becomes cool and deposits its grease before overflowing into the drain. To collect surface water from laundry floors, areas, court-yards, etc., an open trap or gully is used.

For the supply of water to a closet a separate cistern is desirable, especially when water for dietetic purposes is liable to be drawn from the main cistern (instead of being taken direct from the water-service pipe, which is better). It would seem needless to

add, were it not that such faults are common, that no cistern—unless it be exclusively used for water-closet supply—should be placed in the same room with or just under a water-closet, and that the room itself should be well lighted, well ventilated, and well shut off from bedrooms. To prevent the flushing of closets from being imperfect through carelessness, many plans have been devised for ensuring that once the flow of water is started it will continue until a given volume has been discharged. As regards house-drainage generally, the points of chief importance may be briefly summed up as follows: (1) the use of one or more disconnecting traps to shut off sewer gas from the whole system of house-drains and pipes; (2) the thorough ventilation of house-drains, soil-pipes, and branches, by providing openings through which air can enter at the foot and escape at the top; (3) the discharge of all sinks, basins, etc., other than water-closet fittings, and especially of fixed bedroom basins, into open traps in the open air; (4) the direct discharge of cistern overflows and safe-trays into the open air; (5) the use of cleanly and well-designed closets, basins, etc., each sealed by an ordinary bent trap; (6) the use of separate service cisterns for water-closets.

It may seem superfluous to add that the system pipes must provide a rapid and effective carriage of all sewage to the sewer, and must be water-tight and air-tight.

In the United States recent intelligent study of the laws of drainage and ventilation, and of the proper disposal of sewage, has enforced upon the public attention the great importance of this subject. New plumbing laws, in different cities, require the registration of all plumbers, and the publishing of designs before beginning work on new buildings—infringement of these rules being punishable by fines and imprisonment; and although in many cases the regulations are inadequate, their existence is proof that the old-style "scamped" work is rapidly becoming legally impossible. There is a notable improvement, also, in the intelligence of the plumbers themselves, and in the interest which they manifest in their work. The assoc. of master-plumbers is an organization pledged to scientific methods, almost every member of which is a practical sanitary engineer, and into which no "scamp" worker would be admitted. Again, there are now apprentice shops in New York, Philadelphia, and Chicago, which turn out graduates in plumbing, only after a thorough practical training in the art. Thus, at least a beginning has been made in a great reform.

The modern improvements in American plumbing are, briefly, as follows: (1) the use of cast-iron, instead of lead, in the construction of the soil-pipe (to prevent corrosion); (2) the extension of the soil-pipe above the roof for the purpose of ventilation; (3) the ventilation of both ends of the soil-pipe—that of the lower end being secured by a vent-pipe inserted at a point just inside the trap on the main drain; (4) the fastening of an independent trap to each fixture; the old method of connecting all the fixtures with the trap on the water-closet has been abandoned in the best plumbing on account of the foul smells liable thus to be released; (5) the change of direct to indirect connection of house-drains with street sewers by traps fixed at the bottom of the soil-pipe; (6) the ventilation of each trap by a "back air" pipe, which prevents siphonage, and secures a steady circulation of fresh air; (7) special ventilation for the receivers of water-closets, which, to be useful, must have a fresh-air inlet, and must be near a warm flue to secure an upward draught. The plumbing regulations set forth many requirements concerning materials, some of which are here enumerated: tile-pipe is forbidden for drains; double-weight, well-tarred cast-iron, or lead pipe must be used; water-closets and other fixtures must be near the outer walls, and at a distance from the centre of the house; pipes in the cellar must be laid above ground, and so secured as to allow of easy examination; all kitchen drain and waste-pipes, etc., must be absolutely disconnected from main drains; properly constructed traps must be used for this purpose; all drains must be small enough to be thoroughly flushed after each using of a fixture; each water-closet must have a special cistern or tank. The subject of sewer ventilation is one of the chief sanitary problems of the day. The man-holes in use in the cities of the United States do not seem to bring about the desired effect; but the foul odors are doubtless due to the accumulated filth in the sewers, owing to an insufficient fall and improper flushing, as well as to the scarcity of these man-holes. In some foreign cities, the soil-pipes are utilized for ventilators; and it has been proposed to turn our soil and gas-pipes into means for ventilating and allowing the escape of the foul sewer gases. With properly constructed sewers, however, the simple system now in use would prove adequate. That they are at present a source of danger and discomfort, Col. Waring's report to the National Board of Health fully shows: "They are highest at the lower end, lowest in the middle, biggest at the little end, receiving branch sewers from below, and discharging at their tops; elongated cesspools, half filled with reeking filth, peopled with rats, and invaded by every tide; huge gasometers, manufacturing day and night a deadly æriform poison, ever seeking to invade the houses along their course; reservoirs of liquid filth, ever oozing through the defective joint, and polluting the very earth upon which the city stands."

WATER-SUPPLY, although included under the head of food and beverages, merits special consideration, so important is its relation to health, both directly as a drink and indirectly with reference to its many other uses. It is required for drinking, cooking, the cleansing of person, clothes, and dwelling, and the flushing of closets, sewers, and drains. The hygienic requirements are that water should be good in quality and suffi-

cient in quantity. Good water should be clear, colorless, quite free from suspended matter, of a good lustre, and should have a pleasant sparkling taste, the latter qualities being due to the carbonic acid and atmospheric air dissolved in it. In its chemical composition it ought to be as free as possible from organic matter. The evidence in favor of communication of disease by means of drinking water is now very extensive, and we may cite diarrhœa, dysentery, ague, enteric fever, and cholera, as among the diseases which may be conveyed through this channel. Numerous parasites also find their way into the human body by this means. Hard water is objectionable for cooking and washing, nor can it be recommended for drinking, although some insist upon a certain amount of hardness being essential. In the case of water being impure, boiling, distilling, or filtering may be resorted to. The two former are the most efficacious, but the last has advantages of convenience if properly carried out. Charcoal filters, if properly cleansed, or renewed sufficiently often, are useful, but it is better to have a material that purifies without risking any deterioration of the water itself. Such filters as the spongy iron and the carferal effect this. All filters, however, require to be cleansed or renewed periodically. In a house the chief dangers are from dirty cisterns and from pipes being connected with drains and closets. All supply should be on the constant system, and no pipe supplying a closet should be resorted to for drinking purposes. All overflow pipes should deliver in the open air. The quantity of water required per head may be stated at a minimum of 12 to 16 gallons per diem where there is no general system of drainage. In towns more than this is necessary, and from 30 to 50 gallons are desirable. In sickness generally double the amount is necessary that is required in health. The source of the water ought to be pure—springs, deep wells, and upland surface water being the best. Shallow wells and rivers to which sewage gains access are most to be avoided.

2. PREVENTION OF DISEASE.—This is a large question, on which we can only briefly touch. Much depends upon our knowledge of ætiology or the remote causes of disease. The best rule for preventing disease is to follow out carefully the principles of general hygiene laid down with reference to pure air, pure water, proper food, cleanliness, etc. Some diseases may be more specially provided against, such as paroxysmal fevers, by the use of quinine, and small-pox by vaccination, but for the great majority of diseases no such special preventive is known. Some diseases, such as typhus fever and plague, are successfully combated by scattering the population over a large area and inducing the freest ventilation, and to all diseases this plan may be applied with more or less effect. In those diseases which are known to be communicable, such as scarlet fever, isolation of the patients is an effectual means of arresting the spread; but the poisons of others, such as measles and whooping-cough, are so subtle that isolation can only be looked upon as a measure of doubtful success. Much stress has been laid upon *disinfection* as a means of preventing disease, and if properly carried out it has some efficiency. But it is a mistake to place too implicit reliance upon it as ordinarily practiced. In dealing with clothing, bedding, etc., the best method is the application of heat, at or above the boiling point of water, which may be done by means of dry heat, superheated steam, or boiling water. In fumigating places, burning sulphur or the vapor of chlorine or nitrous acid is used, but to be effectual the air must be rendered for the time irrespirable. The solid and liquid disinfectants (so called) are chloride of lime, the permanganates, carbolic acid, and a great many similar substances, many of which have been made the subjects of patents. A large number of them are merely deodorants. It may be stated generally that disinfectants are useful as adjuncts to other hygienic measures, but they cannot replace them, except to a small extent, and in a very imperfect way.

The Disposal of the Dead.—In order to understand the importance of this subject, the reader must know something of the changes which the body undergoes after death. A body that has been buried gradually breaks up into a large number of comparatively simple compounds, such as carbonic acid, ammonia, sulphureted and carbureted hydrogen, nitrous and nitric acid, and certain more complicated gaseous matters with a very fetid odor, which finally undergo oxidation; while the non-volatile substances usually enter into the soil, and either pass into plants or are carried away by the water percolating the soil. These changes are accelerated by the worms and other low forms of life that usually swarm in decomposing bodies; and the character of the soil materially influences the degree of rapidity of destruction. The bones remain almost unchanged for ages. If a body is burned, decomposition is incomparably more rapid, and different volatile combinations may arise; the mineral salts and a little carbon alone remaining. The question for our consideration is, what is the best method of disposing of our dead, so that the living may suffer the least? Putting aside the visionary schemes for turning the dead to commercial account, there are three methods for consideration—viz., burial in land or in water, or incineration. At present the question is not an urgent one; but it may become so in a century or two, if the population goes on increasing at the present rate. Even in our own time a great change has taken place, and the objectionable habit of interments in and round churches in towns has been given up, cemeteries in the country being now commonly employed, except in the case of country villages. The air over cemeteries is, however, always contaminated, and water percolating through them is unfit for drinking purposes; and there is a

general and very decided opinion that the vicinity of graveyards is unhealthy. The evils are lessened by making the grave as deep as possible, and by placing not more than one body in one grave. Plants should be freely introduced into every cemetery, for the absorption of organic matters and of carbonic acid; and the most rapidly-growing trees and shrubs should be selected, in preference to the slowly-growing cypress and yew. We may add that the superficial space which should be allotted to each grave varies in different countries from 30 to 90 ft., and that the depth should be at least 6 ft. It is required by law that the grave spaces for persons above 12 years of age shall be at least 9 ft. by 4, and those for children under 12 years, 6 ft. by 3. It is likewise required that not less than 4 ft. of earth should be placed over the coffin of an adult, and 3 ft. above that of a child. The time which should elapse before a grave is disturbed for a new tenant varies with the soil and the distance of the body from the surface. Under favorable circumstances, a coffin containing an adult will disappear with its contents in about 10 years; while in a clayey or peaty soil it will remain a century. It is generally assumed that a period of fourteen years is sufficient for the decay of an adult, but long before this time all will have disappeared but the skeleton. If the question should in course of time arise between burying in the sea and burning, it will be decided, Dr. Parkes believes, in favor of the former, on the following grounds: "It is true that the impurities in burning can be well diffused into the atmosphere at large, and would not add to it any perceptible impurity. But if the burning is not complete, fetid organic matters are given off, which hang cloud-like in the air, and may be perceptible and even hurtful. As a matter of expense, too, the system of incineration would be greater than the burial at sea. In the burial at sea the body would go at once to support other forms of life more rapidly than in the case of land-burial, and without the danger of evolution of hurtful products." See BURIAL, CREMATION.

3. THE PERSONAL CARE OF HEALTH.—This may be considered by reference to the special topics, diet, exercise, and clothing.

Diet.—Although about seventy elementary substances are known to chemists, only a comparatively small number of these take part in the formation of man and other animals; and it is only this small number of constituents which are essential elements of our food. These elements are, in the order of their abundance, oxygen, carbon, hydrogen, nitrogen, calcium, phosphorus, chlorine, fluorine, sulphur, potassium, sodium, magnesium, and iron, with traces of silicon, lithium, and manganese.

Carbon, hydrogen, nitrogen, and oxygen are supplied to the system by the Proteid group of alimentary principles (see DIET)—viz., albumen, fibrin, and casein, which occur both in the animal and vegetable kingdoms, and the gluten contained in vegetables. Animal flesh, eggs, milk, corn, and many other vegetable products contain one or more of these principles. The Gelatinoid group also introduces the same elements into the system, when such substances as preparations of gelatin, calves' feet, etc., are taken as food. Carbon, hydrogen, and oxygen are abundantly introduced into the system by the Carbohydrate group in the form of sugar, starch (which occurs in large quantity in the cereal grains, leguminous seeds, roots, tubers, etc., used as food), and also by organic acids (which, as citric, malic, tartaric acid, etc., occur in numerous vegetables employed as food). Carbon, with hydrogen and oxygen, occurs abundantly in the Fatty group of alimentary principles, as, for instance, in all the fat, suet, butter, and oil that we eat; in the oily seeds, as nuts, walnuts, cocoa-nuts, etc.; and in fatty foods, as liver, brain, etc. Phosphorus is supplied to us by the flesh, blood, and bones used as food, and in the form of various phosphates it is a constituent of many of the vegetables used as food. The system derives its sulphur from the fibrin of flesh, the albumen of eggs, and the casein of milk, from the vegetable fibrin of corn, etc., from the vegetable albumen of turnips, cauliflowers, asparagus, etc., and from the vegetable casein of peas and beans. Most of the culinary vegetables contain it, especially the *cruciferae*. Chlorine and sodium, in the form of chlorid of sodium, are more or less abundantly contained in all varieties of animal food, and are taken separately as common salt. Potassium is a constituent of both animal and vegetable food; it occurs in considerable quantity in milk, and in the juice that permeates animal flesh; and most inland plants contain it. We derive the calcium of our system from flesh, bones, eggs, milk, etc. (all of which contain salts of lime); most vegetables also contain lime-salts; and another source of our calcium is common water, which usually contains both bicarbonate and sulphate of lime. Magnesium in small quantity is generally found in those foods that contain calcium. Iron is a constituent of the blood found in meat; and it occurs in smaller quantity in milk, in the yolk of egg, and in traces in most vegetable foods. Fluorine occurs in minute quantity in the bones and teeth. This small quantity is accounted for by the traces of fluorine found by Dr. George Wilson in milk, blood, etc.

These simple bodies are not, however, capable of being assimilated and converted into tissue in the animal body; this combination is effected in the vegetable kingdom, and animals modify and convert the complex compounds which they obtained from vegetables. The number of combined elements varies: thus water contains only 2; sugar, starch, fat, and many organic acids contain 3; while casein, fibrin and albumen exclusive of the mineral salts in their ash, contain 5.

It would be impossible, and it is quite unnecessary, to mention in this article the

different animals and plants that are used as food by different nations. The subject is, however, an interesting one, and those who wish to study it may be referred to Moleschott's *Physiologie der Nahrungsmittel*, 1850, and especially to Reich's *Nahrungs- und Genussmittelkunde* (1860-61), which is the most learned and elaborate work on the subject in any language.

DRINKS are merely liquid foods. They all pertain to the aqueous group noticed in the article DIET. They are arranged by Pereira in his *Treatise on Food and Diet* in the six following orders :

1. Mucilaginous, farinaceous, or saccharine drinks—as toast-water, barley-water, gruel, etc. They are very slightly nutritive, and differ but little from common water.

2. Aromatic or astringent drinks—as tea, coffee, chocolate, and cocoa. The action of the first two is noticed in the article DIET. The last two drinks contain a considerable quantity of oil and starch.

3. Acidulous drinks—as lemonade, ginger-beer, raspberry-vinegar water, etc. They allay thirst both by the acid which they contain and the water, and form cooling antiscorbutic drinks.

4. Drinks containing gelatine and osmazome—the broths and soups. These, if properly prepared, should contain all the soluble constituents of their ingredients.

5. Emulsive or milky drinks—as animal milk, the milk of the cocoa-nut, and almond milk, a drink prepared from sweet almonds. Animal milk contains all the essential ingredients of food ; the others are slightly nutritive.

6. Alcoholic and other intoxicating drinks—including malt liquor or beer in its various forms of ale, stout, and porter ; wines ; spirits in their various forms of brandy, rum, gin, whisky, etc.

Alcoholic drinks, so far as they are foods at all, are very costly from an economic standpoint, and of, at least, debatable utility. Their action has been noticed in the article DIET, and will be further discussed in the article TEMPERANCE.

We shall conclude this part of the subject with a word or two on the condiments or seasoning agents which are taken with foods for the purpose of improving their flavor. Excluding salt, which must be considered as a saline alimentary principle, the most common condiments, such as mustard, capsicum (Cayenne pepper), pepper, the various spices, etc., owe their action to the presence of a volatile oil. Sauces are usually fluid mixtures of these condiments with alimentary substances. Condiments and sauces afford little or no nutrition. They do, however, exert special action on the nervous system to stimulate secretion and also to retard tissue change and waste. Any more than a very moderate use is likely to impair the digestion and nutritive processes. Salt has a special value in promoting diffusion through the animal membranes and in bringing some of the alimentary principles into solution. Its decomposition probably furnishes the hydrochloric acid to the gastric juice.

The cookery of foods, although partially noticed in the articles on BOILING, BROILING, COOKERY, DIET, etc., requires some general consideration in the present place.

All foods possessing an organized structure, as animal flesh and amylaceous substances, require to be cooked before being eaten, the only exceptions being the oyster and some ripe fruits. The processes of salting, pickling, and smoking harden the animal textures, and in some cases induce changes which render the meat less nutritious.

The ordinary operations of cookery are boiling, roasting, broiling, baking, and frying.

In the case of vegetables boiling affects the solution of gummy and saccharine matters, the rupture and partial solution of starch granules, the coagulation of albuminous liquids, and the more or less complete expulsion of volatile oil. In the boiling of flesh there takes place a more or less perfect separation of the soluble from the insoluble constituents, according to the duration of the boiling, the amount of water employed, and its temperature at the commencement of the operation. If we wish the boiled meat to contain the largest amount of nourishing matter, and disregard the soup or broth that is formed during the boiling, we introduce it into the boiler when the water is in a state of brisk ebullition. We keep up this boiling for a few minutes, in order to coagulate the albumen near the surface, and thus to convert it into a crust or shell, which equally prevents the entrance of water into the interior, and the escape of the juice and soluble constituents of the flesh into the water. If cold water is then added, so as to reduce the temperature to about 160° F. (70° C.), and this temperature is kept up for the necessary time—for which in reference to the weight of the meat see article BOILING—all the conditions are, according to Liebig, united which give to the flesh the quality best adapted to its use as food.

If, on the other hand, we wish to obtain good soup from meat, we should place it in cold water, and bring this *very gradually* to the boiling point. The interchange between the juices of the flesh and the external water, which was prevented by the former process, here takes place without hindrance. "The soluble and sapid constituents of the flesh are dissolved in the water, and the water penetrates into the interior of the mass, which it extracts more or less completely. The flesh loses while the soup gains in sapid matters ; and by the separation of albumen, which is commonly removed by skinning, as it rises to the surface of the water, when coagulated, the meat loses its tenderness, and becomes tough and hard ; and if eaten without the soup, it not only

loses much of its nutritive properties, but also of its digestibility." Liebig's *Researches on the Chemistry of Food*, p. 128.

Roasting is applied much more to meat than to vegetables. Both in roasting and broiling meat, the first application of heat should be considerable and rapid, so as to form an outer coating of coagulated albumen (just as in boiling), which retains the nutritive matters within the cooked meat. In roasted meat, nothing is removed but some of the superficial fat and the gravy, which is itself an article of food. The effect of roasting on such vegetables as apples and potatoes is to render them more nutritive and digestible than they would be in the raw state, by splitting their starch granules and rendering them more soluble.

Baking (q.v.) acts in the same manner as roasting, but meat thus cooked is rendered less wholesome, in consequence of its being more impregnated with empyreumatic oil.

Frying is the most objectionable of all kinds of cookery. In this operation heat is usually applied by the intermedium of boiling fat or oil. Various products of the decomposition of fat are set free, which are very obnoxious to the stomachs of invalids.

Liebig has shown that salted meat is, in so far as nutrition is concerned, in much the same state as meat from which good soup has been made. After flesh has been rubbed and sprinkled with dry salt, a brine is formed amounting in bulk to one third of the fluid contained in the raw flesh. This brine is found to contain a large quantity of albumen, soluble phosphates, lactic acid, potash salts, creatin, and creatinin—substances which are essential to the constitution of the flesh, which therefore loses in nutritive value in proportion to their abstraction. An excellent presentation of this subject may be found in W. Mathieu Williams' *The Chemistry of Cookery*.

The preservation of food requires some notice. Various methods are noticed in the article ANTISEPTICS. The indications to be met are the preservation of the food without considerably raising its price, impairing its nutritive power, or introducing substances of a hurtful nature. Four general methods are in use on an enormous scale—Refrigeration, Drying, Exclusion of Air, and Antiseptics.

The method of refrigeration is, on a small scale, familiar to every one by the use of ice in the ordinary household refrigerator. By means of ice directly, or by the evaporation of liquid carbonic acid gas, sulphur dioxide, or ammonia this method is applied to the preservation of meat and vegetables in large "cold-storage" warehouses; and by its means fresh meats are transported from Australia and the western part of the United States to the great centres of population, in cars and ships of special construction.

The method of drying—evaporation of water by sun heat or in ovens—is largely applied to meats and to fruits and vegetables. Food stuffs so treated reabsorb moisture and deteriorate after a time. They are also usually altered in flavor. Certain fruits like raisins, figs, and dates are very palatable after such treatment.

The method of exclusion of air, sometimes called Appert's method, from its inventor in 1809, is applied to almost every kind of perishable food, and constitutes one of the great industries of the world. It consists in subjecting the article to be preserved to a temperature sufficient to destroy the germs which cause decomposition, and then putting it into tins or jars, which are immediately made air-tight. Certain special devices of limited application are resorted to, as the exclusion of air by means of oils and fats and varnishes.

The method of antiseptics finds application chiefly in the use of smoke, sugar, salt, alcohol, vinegar, and saltpeter. The use of these preservations is familiar; smoke, antiseptic from its creosote, is used in the preservation of pork and beef, sugar in a thick syrup for many fruits; salt is largely applied to fish, but has some objectionable qualities, noticed in a preceding paragraph. Many other antiseptics have been tried with food, but are generally considered objectionable from their taste or physiological action—glyceryl borate and salicylic acid are of the number.

The adulteration of food of almost every kind is unfortunately so common a custom, that our limited space will merely allow of our noticing a few of the leading points in regard to it.

This subject has been thoroughly investigated in England and on the Continent, as well as in Canada and in many of the United States, and the literature is abundant. The reader is referred for more extended treatment to such books as Blythe's *Practical Chemistry*, Hassall's *Food and its Adulterations*, the reports of the Canadian Department of Inland Revenue, and the annual reports issued by the Boards of Health of the various states.

Adulterations are naturally divisible into two classes—the addition of articles of a positively hurtful nature, and the addition of harmless, but less valuable materials (or the abstraction of a valuable portion, as the cream from milk). Most adulterations are of the latter class—harmless, but fraudulent.

Wheat flour has been found by English chemists to contain a great variety of articles, among which are the cheaper starches, like potato starch, chalk, bone dust, plaster of Paris, clay, and alum. Examinations in the United States do not correspond in their results to this list. Alum, an extremely objectionable adulterant, from its irritant effect and its precipitating effect on the soluble phosphates, has been found in a few cases.

*Arrow-root** has been very extensively adulterated, chiefly with potato starch.

Baking Powder and *Bread* most frequently when adulterated contain alum.

Butter has been extensively adulterated with other fats. "Oleo oil" when worked into genuine butter in a small proportion is very difficult of detection. Butter is frequently artificially colored.

Candy has been found to contain chalk, starch, gypsum, and a great variety of improper coloring materials. Grape sugar and glucose, perhaps, should be considered legitimate constituents of candy, rather than adulterations. At any rate, their use is common.

In *Chocolate* and *Cocoa* have been found starch, flour, and Venetian red.

Ground Spices have furnished a great field for admixture of other substances. In *cinnamon* have been found corn meal, corn starch, cassia bark, bran flour, buckwheat husks, "millings," mustard, pea meal, wheat flour; in *allspice, cloves, mustard, pepper*, and *ginger* occur a similar variety of foreign substances, with some special additions; in *ginger*, Cayenne, corn meal, and turmeric; in *mace*, ochre, turmeric, and Venetian red; in *mustard*, Cayenne, chromate of lead, terra alba, turmeric; in *red pepper*, mustard husks, oxide of iron. The addition of flour and starches is often regarded as unobjectionable, especially if indicated by the manufacturer upon the package.

In the case of *Coffee*, while there exists a patent for compressing sophisticated ground coffee into berries, it does not appear that whole berries are often, if ever, anything but genuine. *Ground coffee* is, however, subject to adulteration by chicory and the flour of beans, peas, wheat, rye, corn.

Milk is now carefully looked after; watering, skimming, adding soda to neutralize acidity, the occasional use of antiseptics are the most common deceptions in connection with its sale.

Pickles not infrequently are colored by means of salts of copper, and mineral acids have been found in the vinegar.

Sugar has been found to contain, in the cheaper grades, starch sugar; but this is never the case with the higher priced grades of granulated sugars, as sold by reputable dealers.

In *Tea* has been found gypsum, chromate of lead, exhausted leaves, tea of lower grades, Prussian blue, stalks, sweepings.

Vinegar, which should contain 5 to 6 per cent of acetic acid, has often been found much weaker and occasionally to contain mineral acids.

Notwithstanding the numerous adulterations found, it should be remembered that foods are more commonly subjected to analysis because they have aroused suspicion, and, after all, that the chance of being cheated by such adulterations is much greater than the chance of being poisoned. The effect of legislation and inspection is well shown in the Dominion of Canada, where the first year after provision for analysis was made over 51 per cent of all the samples examined were adulterated, while in the sixth year the adulterations were only 25 per cent of the whole.

The pecuniary economy of various foods has been of late the subject of much investigation in Europe and in the United States. Protein is an essential food, since from no other source can the animal obtain nitrogen; it is also much the costliest form of food. The ratios used by Atwater are 5.3 and 1 for the relative cost of Protein Fats and Carbohydrates. It is, therefore, important economically to obtain Protein in its cheapest form, and to use no more than is sufficient for the requisite nitrogen and then to use Carbohydrates (starches, etc.) in preference to fats for carbon and hydrogen. Oatmeal, beans, potatoes, and wheat flour are among the cheapest foods, considering their nutritive value, as oysters, salmon, and lobsters are among the costliest. This subject, which can only be mentioned here, may be found treated in a popular manner in several numbers of *The Century Magazine* for 1887, by W. O. Atwater. A vast collection of statistics upon the subject of Food exists in *Chemie der menschlichen Nahrungs-und Genuss-mittel*, von J. König (1889).

Exercise.—Exercise is the subject that next claims our consideration, and we shall briefly notice its effects on the different systems of organs. (1) The most important effect of muscular exercise is produced on the *lungs*, the quantities of inspired air and of exhaled carbonic acid being very much increased. Taking the air inspired in a given time in the horizontal position as unity, a man walking 3 m. per hour inspires 3.22; and if carrying 34 lbs., 3.5; a man walking 4 m. per hour inspires 5; and when walking 6 m. per hour, no less than seven. Almost twice as much carbonic acid is exhaled during exercise as during rest. Hence, muscular exercise is necessary for the due removal of the carbon; and it is obvious that in a state of prolonged rest, the carbonaceous food must be diminished, or the carbon will be liable to accumulate in the system; and further, it is clear that, for strong exercise, carbonaceous food should be freely given. (2) The action of the *heart* rapidly increases in force and frequency during exercise. The increase in the number of beats may range from 20 to 30, and is sometimes much more. After exercise, the heart's action is diminished. Excessive exertion may do harm by inducing pulmonary congestion, and even hæmoptysis, pal-

* These lists of adulterants are taken mainly from recent reports from the U. S. and Canada, and for lack of space omit many things which have been found elsewhere.

pitiation, hypertrophy, valvular disease, and occasionally rupture; while deficient exercise probably tends to induce tuberculous disease of the lung, weakness of the heart's action, and probably dilatation and fatty degeneration. From these facts we learn, that when a person commences any new form of exercise or gymnastics, the heart's action should be watched, and if the pulse rise to 120 or more, the exercise should for the time cease. (3) The *skin* becomes red from increase of blood in the capillaries, and the perspiration is increased, being at least doubled. The bodily heat is kept down by cutaneous evaporation, which reduces the temperature. During exertion, there is very little danger of chill, but the danger becomes great when the exertion is over, because there is then a rapid fall in the heat of the body, while the evaporation of the skin continues. Hence, while the skin may be freely exposed during exercise, it must be covered immediately afterward in order to prevent any feeling of coolness on the surface. (4) The *muscles* grow to a certain limit, but over-exercise of any special group may produce wasting. Care must be taken that the exercise is of such a nature that all the muscles, and not single groups, should be brought into play; and that in early training, long intervals of rest should intervene between the periods of exercise. (5) The effect of exercise on the *mind* is not clearly determined; great bodily activity is often observed in association with full mental activity; but there is a fear that, in our great public schools and universities, boating and cricket are supplanting more useful subjects, and leaving too little time for the due performance of intellectual work. (6) *Digestion* is improved by exercise. The appetite increases, and nitrogenous substances, fats, and salts, especially phosphates and chlorides, are required in greater quantity than in a state of rest. (7) The *change of tissues* is increased by exercise, or, in other words, the excretions give off increased quantities of carbon, nitrogen, water, and salts. The muscles require much rest for their reparation after exercise, and they then absorb and retain water, which seems to enter into their composition. So completely is the water retained in the muscles, that the urine is not increased for some hours. Hence, observes Dr. Parkes, there is an absolute necessity of water for the acting muscles, and the old rule, held by trainers, of only allowing the smallest possible quantity of fluid, must be wrong.

Clothing.—The object of clothing is to preserve the proper heat of the body by protecting it both from cold and heat, and thus to prevent the injurious action of sudden changes of temperature upon the skin. The most important materials of clothing are cotton, linen, wool, silk, leather, and india-rubber. *Cotton*, as a material of dress, wears well, does not readily absorb water, and conducts heat much less rapidly than linen, but much more rapidly than wool. From the hardness of its fibres, its surface is slightly rough, and occasionally irritates a very delicate skin. Its main advantages are cheapness and durability. In merino it is mixed with wool in various proportions, and this admixture is far preferable to unmixed cotton. *Linen* is finer in its fibres than cotton, and hence is smoother. It possesses high conducting and bad radiating powers, so that it feels cold to the skin; moreover, it attracts moisture much more than cotton. For these reasons, cottons and thin woollens are much preferred to linen garments in warm climates. *Silk* forms an excellent underclothing, but from its expense, it can never come into general use. *Wool* is superior both to cotton and linen in being a bad conductor of heat, and a great absorber of water, which penetrates into the fibres and distends them (hygroscopic water), and also lies between them (water of interposition). "This property of hygroscopically absorbing water is," as Dr. Parkes observes, "a most important one. During perspiration, the evaporation from the surface of the body is necessary to reduce the heat which is generated by exercise. When the exercise is finished, the evaporation still goes on, and to such an extent as to chill the frame. When dry woollen clothing is put on after exertion, the vapor from the surface of the body is condensed on the wool, and gives out again the large amount of heat which had become latent when the water was vaporized. Therefore, a woollen covering, from this cause alone, at once feels warm when used during sweating. In the case of cotton and linen, the perspiration passes through them, and evaporates from the external surface without condensation; the loss of heat then continues. These facts make it plain why dry woollen clothes are so useful after exertion. In addition to this, the texture of wool is warmer, from its bad conducting power, and it is less easily penetrated by cold winds." *Leather* is used not only for shoes, boots, and leggins, but, in cold, windy countries, for coats. Leather and sheep-skin coats are in common use in Turkey, Tartary, Persia, the Danubian provinces, and in Canada, where buffalo skins are often used. For persons specially susceptible to cold, and of delicate organization, a chamois leather jacket worn over a flannel waistcoat may be recommended with advantage during the winter months. *India-rubber* clothing must be used with extreme caution. From its being impenetrable to wind, and from its condensing and retaining the perspiration, it is decidedly objectionable; while on the other hand, its protection against rain is a very valuable property. The council of health of the French army have refused to admit waterproof garments among their soldiers; and in Gt. Britain it has been prohibited among the London postmen.

In relation to protection against heat, we have to consider the color and not the texture of clothing. White is the best color, then gray, yellow, pink, blue, and black. Hence, in hot countries, white or light gray clothing should be preferred.

The shape and weight of all articles of clothing should be such as to allow of the freest action of the limbs, and in no way to interfere by pressure with the processes of respiration, circulation, or digestion. In a complete treatise on hygiene, a discussion on the relative advantages and disadvantages of the various articles of clothing used by both sexes would find a proper place, but our limited space totally precludes us from entering into this subject.

Personal Cleanliness.—Attention to the state of the skin is of great importance in a hygienic point of view. The perspiration and sebaceous matters which are naturally poured out upon the surface of the body, with an intermingling of particles of detached epidermis, fragments of fibres from the dress, dirt, etc., if not removed, gradually form a crust which soon materially interferes with the due excreting action of the skin. There is little doubt that the daily use of the matutinal bath, which less than half a century ago was unheard of, and is now a matter of necessity with most healthy persons who have the means of using it, has contributed materially to harden the system against attacks of colds, rheumatism, etc. When a tub and sponge happen to be unattainable, a wet towel rubbed over the body, followed of course by a dry one, is a good substitute.

Much, of late years, has been done to promote the study of sanitary science, and nowhere more than in the United States. The state boards of health have by their annual reports spread a practical knowledge of the subject among the people as a whole; and work has been admirably supplemented and extended by the American Public Health Association, by whose efforts Congress was induced to establish the National Board of Health. The names of Professors Parker, Haine, and Chandler, of New York; of Dr. Billings, of the United States Army; of Drs. Hunt, Kedzie, Baker, and Bowditch, and of Col. George E. Waring, are familiar to every student of the science, both here and among the scientists of Europe.

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SANITARY SURVEY. See SANITARY SCIENCE: HEALTH: HEALTH, MUNICIPAL BOARDS OF: and HYGIENE.

SAN JACINTO, a co. in s.e. Texas; bounded on the n.e. by the Trinity river; drained by the branches of the San Jacinto river; about 640 sq.m.; pop. '90, 7360, inclu. colored. The surface is rolling. The soil is fertile. The principal productions are corn and cattle. Co. seat, Cold Spring.

SAN JACINTO, BATTLE OF, near San Jacinto bay, Texas, April 21, 1836, between the Texan troops, 700 in number, under Gen. Houston, and about 1500 Mexicans, under Santa Anna. Harrisburg, then the capital, was burned by the Mexicans on the night of the 18th. Houston was marching on a parallel line with the Mexicans with a view to get control of the ferry over the San Jacinto. Santa Anna, endeavoring to cut off Houston's retreat, came up to the bay about the same time with him. The opposing forces took up positions about one mile apart, and Houston, relying on his knowledge of the ground, resolved to fight. After some preliminary skirmishing on the 20th, the battle took place on the 21st. It was hardly more than a sharp charge by the Texans, who rushed on with the cry "Remember the Alamo." Santa Anna fled, but was afterward captured. He was released on parole on condition to do his best to insure the recognition of Texan independence. The Texan loss was only 8 killed and 25 wounded.

SAN'JAK, a Turkish word signifying "a standard," is employed to denote a subdivision of an *eyalet* (q.v.), because the ruler of such a subdivision, called *sanjak-beg*, is entitled to carry in war a standard of one horse-tail. The sanjak is frequently called a *liwa*, and its ruler a *mirmirvan*.

SANJAK-SHERIF. See FLAG OF THE PROPHET.

SAN JOAQUIN', a river of California, rises in the Sierra Nevada, and runs first s.w. to its junction with the outlet of lake Tulare, thence n.w. to its junction with the Sacramento river, 50 m. from the bay of San Francisco. It receives numerous branches from both the coast range of mountains and the Sierra Nevada. Entire length, 350 m., for only a small portion of which it is navigable for large vessels.

SAN JOAQUIN', a co. in central California; drained by the San Joaquin river and by the Calaveras and other of its branches; traversed by several branches of the Southern Pacific railroad; 1380 sq. m.; pop. '90, 28,629, chiefly of American birth. Co. seat, Stockton.

SANJO SANÉYOSHI, a former premier of Japan, b. in Kioto, 1836, of one of the most illustrious families in the Kuge, or court nobility. For sympathizing too strongly with the attempts to restore the mikado to his ancient power he and six other nobles were banished from Kioto, 1863, to Chōshiu and deprived of their honors and titles by the Tycoon's ministers resident in Kioto. These six nobles were restored to honor and office after the palace revolution and *coup d'état* of Jan. 3, 1868, and Sanjo Sanéyoshi was made an active member of the new government. In 1871, by a decree of the mikado, he was made *dai jō dai jin*, or premier, and in 1886 chancellor; he d. 1891.

SAN JOSÉ, city and co. seat of Santa Clara co., on a plateau between the Coyole and Guadalupe rivers, and the Southern Pacific railroad; 51 miles s. of San Francisco. The city has suburbs extending beyond each river, and is the seat of the state normal school, the university of the Pacific (Meth. Epis.), the state asylum for the chronic insane, St. Joseph's college, and the college of Notre Dame. There are a public library, U. S. government building, Pratt home for old ladies, O'Connor sanitarium, home of benevolence, court-house, opera house, music hall, several public parks, including a reservation in Penitencia cañon, rescue and night missions, Y. M. C. A., high, grammar, and kindergarten schools, and daily, weekly, and monthly periodicals. The city is lighted by electricity, and has electric street railroads, national and state banks, and about 20 churches. The principal industry is fruit-growing and canning. The city (pueblo) was founded by the Spaniards in 1782, and under the first constitution of the state was the seat of government. Pop. '90, 18,060.

SAN JOSÉ, or **SAN JOSE DEL INTERIOR**, the capital of Costa Rica, Central America, on the river Carthago, and 15 m. w.n.w. of the remains of the town of that name, which was formerly the capital of the country. It stands on a table-land 3757 feet above sea-level, contains a number of important institutions (including a university and an observatory), and carries on an active trade. Its ports are Punta Arenas, on the gulf of Nicoyas, 60 m. west, and Limon on the Caribbean coast. The most important export is coffee, which has lately, however, been unremunerative. Pop. '92, 39,112.

SAN JUAN, a co. in s. w. Colorado; formed 1876; traversed by the Animas river, the Uncompahgre river, and minor streams; surface quite mountainous, and partially covered with evergreens. The mines here produce large quantities of silver, also coal, granite, copper, and galena. Mts. Æolus and Sultan are the two prominent peaks of the San Juan range. Pop. '90, 1572. Area, 500 sq. m. Co. seat, Silverton.

SAN JUAN, a co. in New Mexico; 6008 sq. m.; pop. '90, 1890. Co. seat, Aztec.

SAN JUAN, a co. s. e. in Utah; formed 1880. Pop. '90, 365. Area, 9178 sq. m. Co. seat, Monticello.

SAN JUAN, a co. situated in n. w. Washington, comprising the islands of San Juan, Orcas, Lopez, Blakely, Decatur, Shaw, Waldron, Henry, Spiedan, Stuart, and Sucia, with a few islets, all in Puget sound, between Vancouver island and the mainland; about 600 sq. m., San Juan and Orcas islands about 60 sq. m. each; Lopez, 30. These islands previous to the San Juan boundary dispute (q.v.) were part of Whatcom co., but in 1873 were made into the present co. Pop. '90, 2072. Co. seat, Friday Harbor.

SAN JUAN BOUNDARY QUESTION arose under the treaty of June 15, 1846, between the United States and Great Britain in regard to the Oregon boundary, which was made by the treaty the 49th parallel as a line to "the middle of the channel which separates the continent from Vancouver island, and thence southerly through the middle of said channel and of Fuca straits, to the Pacific ocean." Afterward a difference of opinion arose between the two countries as to what "channel" was meant; the United States maintaining that it was the canal de Haro, and Great Britain that it was Rosario strait, so that it remained unsettled to which government Washington sound and the islands in it belonged. An amicable arrangement was effected in 1859, by which the two governments jointly occupied the island, the United States having a garrison in the s. and Great Britain in the north. The treaty of Washington (1871), art. 34, referred the controversy to the emperor of Germany, who decided for the United States in 1872. The British garrison left in November.

SAN JUAN DE LA FRONTERA, a t. of the Argentine republic, the capital of a province of the same name in the extreme w. of the republic. The town, 95 m. n. from Mendoza, stands on the right bank of a river, also called San Juan de la Frontera, which rises in the Andes, and falls into the large salt lake of Guanacache. The province is as yet only very partially settled, but exports considerable quantities of fruits and wine. The chief seat of trade is this town, which had a pop. '93, (est.) of 15,000.

SAN JUAN DE PORTO RICO. See PUERTO RICO.

SAN JUAN RIVER, a river of Nicaragua, the sole outlet of lake Nicaragua. After leaving the s.e. end of the lake, it flows in a s.e. course for 120 m. and empties into the Atlantic. Its delta is large, and there are three channels, the Taura, San Juan, and Colorado. The last is the only one easily navigable, but lies within the limits of Costa Rica. The town of San Juan del Norte, or Greytown, lies near the San Juan channel, but its harbor has in large part been filled with sand, and is now difficult of access. The river has a number of branches of which the San Carlos and Sarapiquí are the largest. The San Juan is part of the Nicaragua route for the interoceanic canal (q.v.); and has several times been surveyed with a view to its use for that purpose. See INTER-OCEANIC SHIP CANAL. The total length is about 108 m.

S'ANKARA, or S'ANKARĀCHĀRYA, i.e., the *āchārya*, or spiritual teacher, S'ankara, is the name of one of the most renowned theologians of India. His date, as is the case with most celebrities of that country, is unknown. Tradition places him about 200 B. C., but H. H. Wilson assigns him, with more probability, to the 8th or 9th c. after Christ. With regard to his place of birth and to his caste, most accounts agree in making him a native of Kerala or Malabar, and a member of the caste of the Nambūri Brahmans. In Malabar, he is said to have divided the four original castes into seventy-two, or eighteen subdivisions each. All accounts represent him as having led an erratic life, and engaged in successful controversies with other sects. In the course of his career, he founded the sects of the *Das'nāmi-Dan'd'ins* (see S'AIVAS). Toward the close of his life, he repaired to Cashmere; and finally to Kedārnāth, in the Himalayas, where he died at the early age of 32. His principal works, which are of considerable merit, and exercised a great influence on the religious history of India, are his commentary on the *Vedānta* (q.v.) Sūtras, and his commentaries on the *Bhaga vadgītā* and the principal *Upanishads* (q.v.). His learning and personal eminence were so great that he was looked upon as an incarnation of the god Śiva, and was fabled to have worked several astounding miracles. One of these was his animating the dead body of a king Amaru, in order to become temporarily the husband of the latter's widow, so as to be able to argue with the wife of a Brahman mandana upon the topic of sensual enjoyments—the only topic on which he had remained ignorant, as he had always led the life of a brahmachārin, or bachelor student. A number of works are current in the s. of India relating to his life; among these, the *S'ankara-dig-vijaya*, or the conquest of the world by S'ankara, composed by *Anandagiri*, one of his disciples, is the most important.—See H. H. Wilson, *A Sketch of the Religious Sects of the Hindus*; works, vol. i. (edited by Dr. R. Rost, 1862), pp. 197, ff.; and Cavelly Venkata Ramaswami, *Biographical Sketches of Deccan Poets* (Bombay, 1847).

SANKEY, IRA DAVID, b. Penn., 1840; was engaged in business at New Castle, Penn., 1855-70; afterward became associated with Dwight L. Moody in revival work at Chicago; in Great Britain, where they were instrumental in producing great religious awakenings, 1873-75; and since then in various principal cities in the United States. In these labors Mr. Sankey has had special charge of the devotional singing. He compiled *Gospel Hymns and Sacred Songs and Sacred Songs and Solos*.

SANKHYA (from the Sanskrit *sankhyā*, synthetic reasoning) is the name of one of the three great systems of orthodox Hindu philosophy. See SANSKRIT LITERATURE. It consists of two divisions—the Sāṅkhya, properly so called, and the Yoga (q.v.); and like the other systems (see MĪMĀNSĀ and NYĀYA), it professes to teach the means by which eternal beatitude, or the complete and perpetual exemption from every sort of ill, may be attained. This means is the discriminative acquaintance with *tattva*, or the true principles of all existence, and such principles are, according to the Sāṅkhya system, the following twenty-five: (1), *Prakṛ'iti* or *Pradhāna*, substance or nature; it is the universal and material cause; eternal, undiscete, inferable from its effects; productive, but unproduced. Its first production is (2) *Mahat* (lit. the great), or *Buddhi* (lit. intellect), or the intellectual principle, which appertains to individual beings. From it devolves (3) *Ahankāra* (lit. the assertion of "I"), the function of which consists in referring the objects of the world to one's-self. It produces (4-8) five *tanmātrā*, or subtle elements, which themselves are productive of the five gross elements (see 20-24). *Ahankāra* further produces (9-13) five instruments of sensation—viz., the eye, the ear, the nose, the tongue, and the skin; (14-18), five instruments of action—viz., the organ of speech, the hands, the feet, the excretory termination of the intestines, and the organ of generation; lastly (19), *manas*, or the organ of volition and imagination. The five subtle elements (see 4-8) produce (20-24) the five gross elements—viz., *ākāś'a*, space or ether, which has the property of audibleness, is the vehicle of sound, and is derived from the *sonorous* tanmātrā; air, which has the properties of audibleness and tangibility, is sensible to hearing and touch, and is derived from the *aërial* tanmātrā; fire, which has the properties of audibleness, tangibility, and color, is sensible of hearing, touch, and sight, and is derived from the *igneous* tanmātrā; water, which has the properties of audibleness, tangibility, color, and savor, is sensible to hearing, touch, sight, and taste, and is derived from the *aqueous* tanmātrā; lastly, earth, which unites the properties of audibleness, tangibility, color, savor, and odor, is sensible of hearing, touch, sight, taste, and smell, and is derived from the *terrene* tanmātrā. The 25th principle is *purusha*, or soul. It is neither produced nor productive; it is multitudinous, individual, sensitive, eternal, unalterable, and immaterial. The union of soul and nature takes place for the contemplation of nature, and for abstraction from it, "as the halt and the blind join for conveyance and for guidance, the one bearing and directed, the other borne and directing." From their union, creation is effected. The soul's wish is fruition or liberation. In order to become fit for fruition, the soul is in the first place invested with a *linga-s'arīra*, or *sūkshma-s'arīra*, a subtle body, which is composed of *buddhi* (2), *ahanāra* (3), the five *tanmātrās* (4-8), and the eleven instruments of sensation, action, and volition (9-19). This subtle body is affected by sentiments, but being too subtle to be capable of enjoyment, it becomes invested with a grosser body, which is composed of the five gross elements (20-24), or, according to some, of four, excluding *ākāś'a*, or, according to others, of one alone—viz., earth. The grosser body, propagated by generation, perishes; the subtle frame, however, transmigrates through successive bodies, "as a mimic shifts his disguises to represent various characters." Some assume, besides, that between these

two there is intermediately a corporeal frame, composed of the five elements, but tenuous or refined, the so-called *anushṭ hāna s'arīra*.

Creation, resulting from the union of *prakṛ'iti* (1) and *puruṣa* (25), is *material*, or consisting of souls invested with gross bodies, and *intellectual*, or consisting of the affections of intellect, its sentiments or faculties. *Material creation* comprises eight orders of superior beings—gods, demi-gods, and demons; five of inferior beings—quadrupeds, birds, reptiles, fishes, and insects; besides vegetable and inorganic substances; and man, who forms a class apart. This material creation is again distributed into three classes: that of *sattva*, or goodness, comprising the higher gods, with virtue prevailing in it, but transient; that of *tamas*, or darkness, where foulness or passion predominates; it comprises demons and inferior beings; and between these, that of *rajas*, or impurity (lit. colored condition), the human world, where passion together with misery prevails. Throughout these worlds, soul experiences pain, arising from death and transmigration, until it is finally liberated from its union with person. *Intellectual creation* comprises those affections which obstruct, disable, content, or perfect, the understanding; these amount to fifty. *Obstructions* of intellect are error, conceit, passion, hatred, fear, severally subdivided into 62 species. *Disability* of intellect arises from defect or injury of organs, such as deafness, blindness, etc., and from the contraries of the two next classes; making a total of 28 species. *Content* is either internal or external—the one fourfold, the other fivefold. Internal content concerns nature, proximate cause, time, and luck; external content relates to abstinence from enjoyment upon temporal motives—viz., aversion to the trouble of acquisition, or to that of preservation, and reluctance to incur loss consequent on use, or evil attending on fruition, or offense of hurting objects by the enjoyment of them. The *perfecting* of intellect comprises eight species; it is direct, as preventing the three kinds of pain; or indirect, such as reasoning, oral instruction, amicable intercourse, etc.

Besides the 25 principles, the Sāṅkhya also teaches that nature has three essential *gun'as*, or qualities—viz., *sattva*, the quality of goodness or purity; *rajas* (lit. coloredness), the quality of passion; and *tamas*, the quality of sin or darkness; and it classifies accordingly material and intellectual creation. Thus, four properties of intellect partake of goodness or purity—viz., virtue, knowledge, dispassionateness, and power; and four, the reverse of the former, partake of sin or darkness—viz., sin, error, incontinency, and powerlessness. It is worthy of notice that by power the Sāṅkhya understands eight faculties—viz., that of shrinking into a minute form, to which everything is pervious; of enlarging to a gigantic body; of assuming extreme levity; of possessing unlimited reach of organs; of irresistible will; dominion over all beings, animate or inanimate; the faculty of changing the course of nature; and the ability to accomplish everything desired. The knowledge of the principles, and hence the true doctrine, is, according to the Sāṅkhya, obtained by three kinds of evidence—viz., perception, inference, and right affirmation, which some understand to mean the revelation of the Veda and authoritative tradition.

It will be seen from the foregoing summary that the Sāṅkhya proper does not teach the existence of a supreme Being, by whom nature and soul were created, and by whom the world is ruled. It was therefore accused by its opponents of being atheistical, or as denying the existence of a creator; and it is the special object of the *Yoga* system to remove this reproach, by asserting his existence, and defining his essence (see *YOGA*). The truth, however, is, that the Sāṅkhya proper merely maintains that there is no proof for the existence of a supreme Being; and the passages quoted by the opponents to show that the founder of the Sāṅkhya *denied I's'wara*, or a supreme God, are quite compatible with the view that he confined his teaching to those *tattvas* or principles which, in his opinion, were capable of demonstration. Nor is it at all probable that the founder of the orthodox *Yoga* would have propounded his system as supplementary to that of the Sāṅkhya proper, had there been that incompatible antagonism between them which must separate an atheistical from a theistical philosophy. The Sāṅkhya system underwent a mythological development in the Purāṇas (q.v.), in the most important of which it is followed as the basis of their cosmogony. Thus, *Prakṛ'iti*, or nature, is identified by them with *Māyā*, or the energy of Brahṁā; and the Matsya-Purāṇa affirms that *Buddhī*, or *Mahat*, the intellectual principle, through the three qualities, goodness, passion, and sin, "being one form, becomes the three gods, Brahṁā, Vishṇ'u, and Śiva." The most important development, however, of the Sāṅkhya is that by the Buddhistic doctrine, which is mainly based on it. The Sāṅkhya system is probably the oldest of the Hindu systems of philosophy; for its chief principles are, with more or less detail, already contained in the chief Upanishads (see *VEDA*); but whether the form in which it has come down to us, and in which it is now spoken of as *the Sāṅkhya*, is also older than that in which the other systems are preserved, is a question as yet not solved by Sanskrit philology. That this form, however, is not the oldest one is borne out, for instance, by the differences which exist between the Sāṅkhya doctrine of the Upanishads and the doctrine propounded in the first book of the institutes of Manu on the one side, and the doctrine of the actual Sāṅkhya on the other.

The reputed founder of the actual Sāṅkhya is *Kapila* (lit. *taṇṇy*), who is asserted to have been a son of Brahṁā, or, as others prefer, an incarnation of Vishṇ'u. He taught his system in Sūtras (q.v.), which, distributed in six lectures, bear the name of *Sāṅkhya-*

Pravachana. The oldest commentary on this work is that by *Aniruddha*; another, is that by *Vijnānabhikṣu*. The best summary of the Sāṅkhya doctrine is given by I's'wara Krīṣṇ'a, in his *Sāṅkhya-Karika*, edited by H. H. Wilson, with a translation of the text by H. T. Colebrooke, and a translation of the commentary of Gaud'apāda by himself (Oxford, 1837). For the various theories concerning the word Sāṅkhya, and the founder of the system Kapila, and for the literature relating to it, see the elaborate and excellent preface by Fitzedward Hall to his edition of the *Sāṅkhya-Pravachana*, with the commentary of Vijnāna-bhikṣu, in the *Bibliotheca Indica* (Calcutta, 1856); and see also his valuable *Contribution toward an Index to the Bibliography of the Indian Philosophical Systems* (Calcutta, 1859). Amongst essays on the Sāṅkhya philosophy, the most reliable still remains that by H. T. Colebrooke, reprinted from the *Transactions* of the Royal Asiatic society, in his *Miscellaneous Essays* (London, 1837), vol. i. p. 227, ff.

SAN LU'CAR DE BARRAME'DA, a sea-port and t. of Spain in the modern province of Cadiz, and 15 m. n.w. of the port of that name, stands on a sandy, undulating tract on the left bank of the Guadalquivir, and near the mouth of that river. It is a popular summer and bathing resort. It has salt works, and exports wine, salt, and fruit. Pop. '87, 22,667.

SAN LUIS, a province in central Argentine Republic; bounded on the n. by Rioja, on the e. by Córdoba and Rio Colorado, on the s. by Rio Colorado, and on the w. by Mendoza and San Juan; drained by the Rio Quinto; about 18,000 sq. m.; pop. '95, 81,155. The surface is even in the s. with good pasture land; mountainous in the north. With the aid of irrigation, lucerne, maize, and wheat are raised. Gold, copper, sulphur, lead, salt, porcelain clay, iron pyrites, and galena are found. Horses and cattle are extensively raised. Capital, San Luis.

SAN LU'IS DE LA PUN'TA, the capital of the province of San Luis in the Argentine Republic, is situated 155 m. e.s.e. of Mendoza, on a river which falls into the large salt lake of Bevodero. Pop. '95, 16,000.

SAN LUIS OBISPO, a co. in s.w. California, bounded by the Coast range on the e., the Pacific on the w., and the Santa Maria on the s.; drained also by the Salinas river; area 3404 sq. m.; pop. '90, 16,072, chiefly of American birth. The surface is mountainous but in great part fertile; wheat, corn, barley, hay, and dairy products are the staples. Gold, silver, and coal are found. Co. seat, San Luis Obispo.

SAN LUIS POTOSI', a state in e. Mexico, bounded on the n.e. by Nuevo Leon, on the e. by Tamaulipas and Vera Cruz, on the s. by Queretaro and Guanajuato, and on the w. by Zacatecas; drained by the Tampico and Santander rivers; 24,446 sq. m.; pop. 1895, 546,447. The surface, except in the s.e., is mountainous or hilly. The plains are fertile, and there is much good pasture land among the mountains. There are valuable copper, silver, lead, iron, and mercury mines. The principal productions are corn, barley, wheat, maize, sugar cane, cotton, coffee, and cattle. There are a number of manufactures. Capital, San Luis Potosi.

SAN LU'IS POTOSI', a considerable t. of Mexico, capital of the state of the same name, stands near the source of the river Tampico, and 362 m. by railway n.n.w. of Mexico. It stands on a plateau 6200 ft. above sea-level, is well built, containing many handsome edifices, chiefly ecclesiastical, and is surrounded by gardens. Its markets are well supplied, and it carries on a considerable trade with the neighboring states. It has a university, a number of manufactures, and is a great railroad centre. Pop. '92, 62,573.

SAN MAR'CO IN LA'MIS, a commune of s. Italy, in the province of Foggia, 18 m. n.e. of Foggia. It has some trade. Pop. '81, 15,345.

SAN MARINO, or **MARINO**, one of the most ancient and most limited republican states of Europe, consists of a craggy mountain 2200 ft. in height, situated amidst the lesser ranges of the Apennines, and encircled by provinces formerly belonging to the Pontifical States. It possesses a total area of 32 sq. m., and comprises a t. of the same name, and several villages in the adjacent territory. The climate is healthy, but, owing to its exposure, high winds and frequent rains prevail. The town of Marino is built on a slope of the mountain; it is accessible only by one road, and is protected by walls and towers; it contains several squares and streets, rudely paved, and various public buildings, including five churches, a town-hall, a theatre, the governor's palace, a savings bank, museums, and hospitals. The inhabitants of the republic, who numbered, in '91, 8200, are noted for their hospitality, sobriety, industry, and general morality. They are sensitively jealous of their rights, and cling with tenacity to their territorial and legislative independence. Their chief trade is in agricultural produce, silkworms, wine, and cattle.

The early history of the republic is very obscure. According to a legend it is said to have been founded by Saint Marinus, who is supposed to have come to this place from Dalmatia. It belonged to the exarchate of Ravenna, afterwards to the Franko-Lombard kingdom, and achieved municipal freedom in the middle ages. It owes its independence to its alliance with the Count of Montefeltro and Urbino in the thirteenth century. During the mediæval wars of Italy, Marino had its pigny feuds

and factions, which seem to have been none the less envenomed from the pettiness of the arena in which they were enacted. In 1740 the democratical form of government was securely guaranteed against further assault. The rights of this miniature state were scrupulously respected by Napoleon during his Italian campaign. The government consists of a legislative senate, composed of 60 members, of whom one-third are nobles. From this number are selected the smaller "council of twelve" (two-thirds from the town and the rest from the country), who, with the assistance of a jurisconsult, decide in questions of the 2d and 3d instance. There are two presidents, who are chosen by the senate, the one from the party of the nobles, the other from the bourgeoisie. They each hold office only for six months. The army, or rather the militia, of the republic, numbers 950 men.

SAN MARTIN, JOSÉ DE, 1778-1850; b. Yapeyú; received a military education in Spain, served at Baylen as col. in the Spanish army. He organized the Argentine forces in the war of independence in South America, and was commander in chief, 1814, of the expedition to upper Peru against the viceroy of Lima. He raised an army in the province of Cuyo, and crossing the Chilian Andes defeated Osorio in the battle of Chacabuco 1817. He was offered the presidency of Chili, but declined it; and meeting the Spaniards again at Maypu defeated them, and secured Chilian independence. In 1820 accompanied by Bernard O'Higgins, president of Chili, he made a triumphal entrance into Lima, and in 1821 declared Peru independent and himself protector. In 1822, compelled to resign his office, he retired to private life, residing in England, France, and the Netherlands.

SAN MATEO, a co. in w. California, having the bay of San Francisco on the n., the Pacific ocean on the w.; 460 sq.m.; pop. '90, 10,087, chiefly of American birth, with colored. It is intersected by the Southern Pacific railroad. Its surface is hilly, rising into mountains 3000 ft. high covered with forests of oak and redwood, the latter used largely for building purposes. The climate is warm and mild. Its towns have as residents many merchants of San Francisco who reside in the country. The soil is very fertile. Co. seat, Redwood City.

SAN MIGUEL, a co. in s.w. Col. formed as Ouray, 1877, from part of San Juan; area reduced and present name adopted, 1883; 1300 sq.m.; pop. '90, 2909. The surface is mountainous, Mt. Wilson on the southern boundary having a height of 14,280 ft., but the valleys of the San Miguel and other streams are fertile. Productions, gold, silver, copper, and galena. Co. seat, Telluride.

SAN MIGUEL, a co. in e. New Mexico, adjoining Texas; drained by the Rio Pecos and Canadian rivers; about 13,246 sq.m.; pop. '90, 24,204. The surface is mountainous in the n.w., but productive elsewhere; wheat, corn, hay, wool, and dairy products are the staples; cattle-grazing is extensively carried on. There are several flouring and saw mills. Co. seat, Las Vegas.

SAN MIGUEL, a. t. of Central America, in Salvador, and about 74 m. e. of San Salvador. At its annual fair of La Paz, great numbers assemble, and the fair is considered to be the most important one of San Salvador. About ten m. s.w. of San Miguel is a volcano, 6,000 ft. high, which was in a state of eruption in 1848, and again in 1855. Pop. of municipality, '90, 23,800.

SAN MIGUEL, EVARISTO, Duc de, 1780-1862; b. Gijon, Spain. In 1808 he joined in the movement against the French, became a lieut.col. in the army, and later a delegate to the cortes. In 1820 he joined in Riego's expedition to Andalusia. He was exiled 1821, but recalled the following year and made minister of foreign affairs. After the French intervention of 1823 he was again exiled, but returned to Spain in 1834 and again became a member of the cortes. In 1854 he was president of the Madrid junta, and later minister of war and field-marshal.

SAN MINIA'TO, a city of central Italy, province of Florence, and 21 m. w.s.w. of the city of that name. San Miniato is a fine old episcopal city, adorned with many monuments, and is famous in the history of the Florentine republic. Pop. '81, 2189.

SANNAZARO, JACOPO, a distinguished Italian poet of Spanish descent, was b. at Naples July 28, 1458. Love for a young lady called Carmosina Bonifacia, whom he has celebrated under the names of Harmosine and Filli, was what developed his poetical faculty. The lady being insensible to his passion, he sought to forget her in travel. It was during his absence that he composed the *Arcadia*, a medley of prose and verse, of which Tiraboschi, the historian of Italian literature, thus speaks: "The elegance of the style, the propriety and the choiceness of the expressions, the descriptions, the imagery—everything, in fact, is fresh and original." The work was greatly admired, and in the course of a century went through 60 editions. It has given its author the reputation of being an Italian classic. Sannazaro, after his return to Italy; was invited to the Neapolitan court, and composed some comedies for the amusement of the royal family, of which only one has been preserved. He died at Naples in 1530 or 1532. His other productions are *Sonetti e Canzoni*, *Eeloge VI.* (reckoned by some his most perfect performance); *Elegiarum Libri III.*; *De Morte Christi ad Mortales Lamentatio*; and *De Partu Virginis, Libri III.*, mostly written in Latin verse. Sannazaro's life has been written by Crispo and J. A. Volpi. See also Tiraboschi's *Storia della Letterat. Ital. VII. Part iii.*

SAN NICAN'DRO GAR'GANICO, a t. of southern Italy, in the province of Foggia, 26 m. n. of the city of Foggia. Pop. '81, 8257. It is situated on mount Gargano, and is one of the most populous towns among those mountains.

SAN NICOLA, an Italian island, off the e. coast, and one of the Tremiti group. Pop. '81, 518.

SAN NICOLAS DE LOS ARRAYOS, a t. of the Argentine Republic, in the province of Buenos Ayres. There is a considerable trade and some manufactures are carried on. Great numbers of cattle and sheep are raised and there is considerable agriculture. There are a number of mills, and the town has become a great railroad center. Pop. '92, 18,972.

SAN PATRICIO, a co. in s. Texas, on the gulf of Mexico, n. of Corpus Christi bay, drained by the Nueces and the Aransas rivers; about 630 sq. m.; pop. '90, 1312, chiefly of American birth. The surface is level and heavily timbered. The soil is fertile. The principal production is live stock. Co. seat, Sinton.

SANPETE, a co. in e. Utah, adjoining Colorado; drained by Green, Sanpete, and White rivers; about 1784 sq. m.; pop. '90, 13,146, chiefly of American birth. The surface is traversed in the w. by the Wahsatch mountains, it consists in the e. of large valleys and is heavily timbered. The soil in the e. and along the Sanpete river is fertile. The principal productions are corn, wheat, oats, wool, and cattle. Co. seat, Manti.

SAN RE'MO, a t. of northern Italy, province of Porto Maurizio, 26 m. e.n.e. of Nice. It is built on the slope of a rising ground on the shores of the Mediterranean. The city has a fine cathedral, a theater, and a technical school. There is a seminary for priests, besides a college, and many schools. Its little harbor carries on a brisk trade in oils and lemons. Some foreign consuls reside in the town. San Remo is an ancient city, and obscure in its origin. In 1170 it was self-governed, and made an alliance with the Genoese against the Pisans. One of its bishops afterward sold it to Genoa. "San Remo is perhaps the mildest situation on all the Riviera. Here palm, lemon, and orange trees grow with the greatest luxuriance, and the fruit of the date palm almost attains maturity" (*Murray's Handbook*). In recent years it has begun to be resorted to by English visitors, and several new and excellent hotels have been erected. It is especially popular as a health resort. Pop. '81, 12,285; commune, 16,055.

SAN ROQUE, a t. of Spain, in the modern province of Cadiz, on the bay of Gibraltar, and 8 m. n.n.w. of Gibraltar. The salubrity of the climate, and the cheapness of living, have attracted hither many foreign families, especially English. Pop. '87, 8730.

SAN SABA, a co. in w. Texas, bounded e. and n. by the Colorado, and drained by the San Saba river; 1180 sq. m.; pop. in '90, 6621. The surface is hilly and covered with large forests; the soil is partially fertile. The main productions are wheat, sweet potatoes, honey, wool, molasses, cattle, and swine. It contains sulphur springs. Co. seat, San Saba.

SAN SALVADOR, the smallest, though the first in point of population, of the Central American republics (see AMERICA), consists of a strip of territory stretching along between Honduras and the Pacific, and bounded on the n.w. by Guatemala, and on the e. by Fonseca bay, which separates it from Nicaragua. It averages 190 m. in length, by about 50 in breadth, and contains an area of 7225 English sq. m., with a pop. (according to an official estimate of 1894) of 803,534, or 111 to the sq. mile. The northern frontier is formed by a portion of the great Cordillera chain, and parallel to this range, and between it and the Pacific sea-board, runs another range of mountains along the whole length of the country, breaking it up into an inland valley, and a long, low, rich belt along the coast. This central range is highly volcanic in character, and has volcanic peaks, ranging in height from 4000 to 7386 ft. high. San Salvador possesses numerous lakes, the largest of which is Guija, about 90 m. in circumference, and abounding in fish. The greater portion of the interior valley and the alluvial strip lying along the coast are of extreme fertility, and agriculture is extensively and successfully practiced, to the almost total exclusion of pastoral pursuits. The principal agricultural products are indigo, sugar, coffee, tobacco, beans, rice, and maize, — cotton also being successfully cultivated. The coast from Acajutla (30 m. from the western frontier) to La Libertad is known as the *Costa del Balsamo*, or Balsam coast, as in the woods of this district is produced the famous balsam known as "balsam of Peru." The mineral wealth of San Salvador is not great, but antimony, iron, zinc, coal, mercury, tin, copper, lead, and silver are found. San Salvador has considerable export trade in indigo (which is known in trade as "indigo of Guatemala," and is reckoned the finest of all) and sugar, as well as coffee, gold, silver, and tobacco. The annual value of exports, in 1895, amounted to \$13,847,625, and that of imports to \$2,890,739. The revenue in 1894 was \$8,818,000, the expenditure being \$8,569,000. The internal debt in 1895 was \$11,000,000.

The climate of San Salvador is salubrious, except on the coast and in the valleys, and the temperature is lower than might be expected.

The bulk of the population is composed of Indians and mixed races, there being about 440,000 of the former and about 320,000 of the latter. There are about 40,000 whites (of Spanish origin) and a few negroes. The government is carried on by a president and

four ministers, — one for foreign affairs, justice, instruction, etc., one for war and marine, one for interior and government, and one for beneficence. The legislature consists of a congress of 70 deputies, 42 of whom are proprietors. Almost the entire population is Roman Catholic, although other religions are tolerated. Education is well provided for; in 1893 there were 585 primary schools with 29,427 pupils, 18 higher schools with 1200 pupils, and there is a university in the capital, San Salvador (q. v.), which is attended by upwards of 200 students. There are a national library and museum in the capital. There are over 2000 miles of good roads, and a number of railways in operation or process of construction. In 1893 there were 1802 miles of telegraph and 597 miles of telephone line in the republic. The standing army is 4000 men, with a militia, 1896, of 18,000.

San Salvador, originally called *Cuscatlan*, "the land of riches," is said to have been, previous to the immigration of Europeans, the best peopled and most civilized country in America. It was conquered after a long and obstinate contest by Pedro de Alvarado, a lieut. of Cortes, and under the Spanish rule was one of the most flourishing portions of the Guatemalan kingdom. In 1821 it threw off the yoke and joined the Mexican confederation, from which, however, it seceded in 1823. The several trials since made of a union among the Central American states have ended in the dissolution of all political connection; and San Salvador is now an independent republic. In 1863 war broke out between San Salvador and Guatemala, in which Honduras joined the former, and Nicaragua the latter. The result was the defeat of San Salvador, and the expulsion of the president from the country. In 1890-91 occurred a war with Guatemala which was ended by the intervention of the foreign diplomatic corps.

SAN SALVADOR, the capital of the republic of San Salvador, was founded in 1589, and supplanted an older town which had been built in 1528 by a brother of Pedro de Alvarado. It was the capital of the Union of Central America from 1823 till 1839. In 1854 it was a fine, well-built city, adorned with numerous splendid buildings, and containing a pop. of more than 30,000, but on the night of April 16 it was completely destroyed by an earthquake, and about 100 lives lost. In Jan., 1855, it again became the seat of government, and its pop. in '92 was 20,000. The city has a cathedral, national theater, university, national palace, etc. The buildings are all very low. The trade is carried on mostly through the port of La Libertad.

SAN SALVADOR, or **BANZA** — the former being the Portuguese, and the latter the native name—a t. of Africa, in the Portuguese colony of Angola, in lat. 6° 20' s., long. 14° 47' e. Pop. 700.

SAN SALVADOR, or **CAT ISLAND**. See **BAHAMAS**.

SANSANDING, a large t. in the w. of Africa, in Segu, in lat. 13° 40' n., long. 6° 23' w., on the left bank of the Niger, here called the Joliba. Pop. about 40,000.

SANSÇĀRA, or **SANSKĀRA** (lit. completing, perfecting), is the name of the ten essential rites or ceremonies of the Hindus of the first three castes. They are the ceremonies to be performed at the conception of a child; on vitality in the fetus, in the fourth, sixth, or eighth month of pregnancy; and at the time of his birth, before dividing the navel string; the ceremony of naming the child on the tenth, eleventh, or hundred and first day; the ceremony of carrying the child out to see the moon on the third lunar day of the third light fortnight, or to see the sun in the third or fourth month; of feeding him in the sixth or eighth month (or at other stated periods); the ceremony of tonsure in the second or third year; of investiture with the string in the fifth, eighth, or sixteenth year—when he is handed to a *guru* to become a religious student; and the ceremony of marriage, after he has completed his studies, and is fit to perform the sacrifices ordained by his sacred writings.

SANSULOTTES, i.e., "without breeches," was the name given in scorn, at the beginning of the French revolution, by the court party to the democratic "proletaires" of Paris. The latter accepted this superfine reproach with sardonic pride, and the term soon became the distinctive appellation of a "good patriot," more especially as such a one often made a point of showing his contempt for the rich by neglecting his apparel, and cultivating rough and cynical manners. As the noblesse prided itself on an illustrious pedigree, so the genuine child of the revolution boasted that he was come of a long line of—noteless sansculottes; that his

"Ancient but ignoble blood
Had crept through scoundrels ever since the flood."

Toward the close of the convention, the name, connected as it had been with all the sanguinary excesses of the period, naturally fell into bad odor, and soon after totally disappeared; nor do the French appear to wish that its memory should be preserved, for they have not given it a place in their encyclopedias.

SAN SEBASTIAN, a rising seaport city in the n. of Spain, capital of the Basque province of Guipuzcoa, 48 m. n.e. of Bilbao, and 11½ m. from the French frontier. It is built on a peninsula, at the southern base of a conical hill, called Mont Orgullo, 400 ft. high,

commanding a most striking view, and crowned with a castle strong enough to have obtained for itself the name of the Gibraltar of the n. of Spain. Since its almost total destruction during the Peninsular war, the town has been rebuilt on a regular rectangular plan. The streets are narrow, and are bordered by high houses, and having curtained balconies in front. On the e. of the town is a confined gulf, formed by the embouchure of the Urumea; and on the w. is a magnificent roadstead, protected against enemy and tempest by the isle of Santa Clara and a series of rocks, which offer to vessels only a narrow and dangerous pass. The roadstead is bordered by a beautiful shore, which, on account of its suitability as a watering-place, attracts visitors from all parts of the country. The town communicates with the mainland by a narrow tongue of land, and by a bridge leading across the Urumea, and connecting San Sebastian on the peninsula with the railway station on the mainland. By means of the North of Spain railway, which was inaugurated by the king of Spain, Aug. 15, 1864, the town is placed in direct communication with Madrid and Paris. Commerce increases. The exports consist principally of iron, lead, copper, asphalt, and cement. Pop. '87, 29,647.

San Sebastian has suffered from numerous sieges in the wars between France and Spain. It was captured by the duke of Wellington in 1813, when the dispossessed French garrison set it on fire.

SAN SEVERINO, a town of central Italy, province of Macerata, 32 m. s.s.w. of Ancona. It is well built, and has handsome palaces, a gymnasium and a library; machinery, metal and stone ware, glass and flour are manufactured. The neighborhood produces exquisite wine, oil, and fruit, and cattle are reared on the pasture grounds. Pop. '81, 3196.

SAN SEVERO, a city of southern Italy, province of Foggia, with '81, 19,756 inhabitants, stands in a delightful and fertile open country, producing abundance of crops, and affording rich pasturage. It was once remarkable for the industry and activity of its population. In 1799 it was taken and nearly destroyed by the French. The cholera committed fearful ravages here in 1865.

SAN SING, a t. of China, in the dependency of Manchuria, on the Sungari and the Mutan-kiang. It has considerable grain trade with Khabaravka, and there is a government gold mine in the vicinity. The population is about 15,000.

SANSKRIT, or **SANSCRIT** (from the Sanskrit *sam*=Gr. *syn*, "with, together," and *kr̥ita*, "done," with an epenthetic *s*, imparting greater emphasis to the sense of the compound; hence, "thoroughly done, finished, accomplished") is the name of the ancient language of the Hindus; in which their whole sacred literature, and by far the greatest amount of their numerous ritual, legal, poetical, and scientific works, are written. Sanskrit belongs to that stock of languages commonly called the Indo-European, or Indo-Germanic, which includes the Indian, the Medo-Persian, the Græco-Latin, the Germanic, the Lithuanian-Slavonian, and the Gallo-Celtic families. It is therefore intimately allied to the ancient and modern languages comprised in each of these families, itself being the parent of the *Prākṛit* (q.v.) dialects, the *Pāli* (q.v.), and the languages spoken in the n. of India. Compared with the ancient languages kindred with it, Sanskrit has come down to us in a state of preservation and development so much superior to theirs that it must be looked upon as the principal means which enables us to understand the affinity, and in general the linguistic laws which pervade the structure of these languages. The essay of Franz Bopp, *Ueber das Conjugations system der Sanskrit Sprache*, dated May 16, 1816, began a new era in the study of language. See PHILOLOG., BOPP.

There are two great periods into which the history of the Sanskrit language may be conveniently divided: the first embracing the language as contained in the Vedic hymns (see VEDA); and the second, that represented by the so-called classical Sanskrit, in which the epic works, the law codes, and the later literature are written. Between the two there is a transition period of the language, to which the Brāhman'a and ritual portion of the Vedas, and the Upanishads, may be assigned. In the language of the Vedic hymns, the grammar is less developed and much less settled than in the classical Sanskrit; it contains, moreover, many forms which at the second period became obsolete, or altogether disappeared from use; the structure of its sentences, too, is simpler, though it is more elliptical than in classical poetry. Another main difference between the two periods lies in the sense of its words. Though this is the same in many words of the Vedic hymns and the classical literature, still there are numerous words, which, though the same in form at both periods, have a sense which differs according as it belongs to the one or the other class of writings. The difficulty thus presented by the Vedic hymns is in a great measure removed by the commentators who explain the meanings of the Vedic words, and, in doing so, follow tradition, which, considering the peculiarities of Hindu history, and also internal evidence, is in all probability immemorial, and therefore the safest if not the only guide in the understanding of the oldest Vedic works. That their explanations may have become unsafe in some instances, would be but natural; but it is certain that these instances are the rare exceptions; and it is likewise certain that when modern Sanskritists—and several of these only imperfectly acquainted with Sanskrit grammar—have attempted to supersede those traditional meanings by inter

pretations which they suppose better suited to the context, or to some assumed etymology of their own, their rendering may better adapt the Vedic to the classical vocabulary, but is sure to falsify that understanding which the Hindu mind had of its oldest and most sacred works, and on which its further historical development is based. In the transition period of the Brâhman'a and ritual portion of the Vedas and the Upanishads, grammar and vocabulary offer similar difficulties to those of the Vedic hymns; but though for this reason the aid of the commentaries is likewise indispensable, they are much less numerous; and in those works of this extended period, which probably were composed at the classical epoch, the difference between the two is even inconsiderable. In comparing Sanskrit with other kindred languages, it is therefore necessary not to lose sight of these periods of the language, and of the peculiarities inherent in them.

SANSKRIT LITERATURE. The most natural, and, at the same time, the most scientific distribution of Sanskrit literature would be that according to the dates at which its writings were composed. The actual condition of Sanskrit philology, however, renders such a course impossible; for, with the exception of very few works, no date whatever is known to which they could be safely assigned. (See *INDIA—Religion; VEDA.*) In spite, therefore, of an apparent plausibility with which some authors have propounded a regular literary chronology of Sanskrit works, even with figures or dates appended to them, the general reader will do well to look upon all such dates as imaginary, and to rest satisfied with the hope that perhaps future results of Sanskrit philology may afford a more satisfactory settlement of this vexed question of Sanskrit chronology. Under these circumstances, the only possible arrangement of Sanskrit literature is that suggested by their contents, irrespectively of the time at which they were composed, but, under each head, in that order which, within large margins, may be suggestive of consecutiveness.

1. *Religious Literature.*—It comprises, in the first place, the Vedas, and the mystical, philosophical, and ritual works connected with them (see *VEDA* and *UPANISHAD*); and secondly, the Purân's (q.v.) and Tantras (q.v.), besides prayer-books and smaller works, and treatises of less importance relating to the modern worship, based on the two latter classes of works.

2. *Law Literature.*—It is comprised under the name of *Dharmasâstra* (from *dharma*, law—religious and civil—and *sâstra*, book), and its origin is traceable to the ritual Sûtras relating to the Vedas. A complete *Dharmasâstra* consists of three portions: the first treating of *Āchâra*, or "established rules of conduct," comprising such matters as education, marriage, the funeral rites, the duties of a king, etc.; the second treating of *Vyavahâra*, or judicature, including law, private and criminal, and under the former, for instance, the law of inheritance and adoption; the third, on *Prâyas'chitta*, or penance, treating, besides this subject, also of impurity, the duties of a devotee, transmigration, and final beatitude. The chief extant representatives of this class are the codes of Manu (q.v.) and Yājñavalkya (q.v.). Less complete than the latter—for it does not contain the *Vyavahâra* portion—is the code of Parâsara (q.v.); but it deserves special mention, as the modern Hindus consider it to have been especially composed for the requirements of the Kaliyuga, or the present mundane age, and as it is cited, therefore, as the authority, for instance, on the question, and in favor, of the remarriage of Hindu widows. For practical purposes, especially those concerning *Vyavahâra*, the chief actual authorities are the commentaries on Manu, *Yājñavalkya*, and similar works, and the digests which have grown up from them. Among the former, the *Mitâksharâ* (q.v.), by Vijnânes'wara, occupies the principal rank; and amongst the latter, the *Chintâmanî*, *Vîramitrodaya*, *Vyavahâra-mayûkha*, *Smṛ'tichandrikâ*, and *Vyavahâra-Mâdhaviya*, which generally defer to the authority of the *Mitâksharâ*; and, besides these, the *Dâyabhâga* of Jimûtavâhana, which, like the *Dâyatatva* of Raghunandana, differs from it on several important questions, for instance, on that relating to the hereditary rights of women. (See *MITÂKSHARÂ*.) As on the *Vyavahâra*, there are numerous smaller treatises on the *Āchâra* and *Prâyas'chitta*.

3. *Poetical Literature.*—(a.) The two great epic poems. See *RÂMÂYAN'A* and *MAHÂ-BHÂRATA*.

(b.) *The Modern Epic Poems.*—Their subject-matter is entirely borrowed from the two great epic poems and other legendary works; and their only merit consists in the art bestowed by their authors on the versification, and all that relates to the æsthetical canon of Hindu poets, which, in some respects, may meet with the approbation of western critics, but, in others, would require in the European reader a total abnegation of his ideas of poetical beauty, in order to make these poems acceptable to him. Minute descriptiveness, elaborateness of diction, and an abundance of figures of speech, are some of the characteristics of these poems, among which those of Kâlidâsa approach nearest our standard of poetical worth. One of them, the *Bhâttikāvya*, which relates to the history of Râma, was purposely composed for illustrating rules of grammar and formations of words of special interest. In another, the *Râghava-Pândaviya*, the ambiguity of the diction is so studied that the poem may be interpreted as relating to the history of Râma, or other descendants of Das'aratha (see *RÂMÂYAN'A*), or to that of the descendants of Pând'u (see *MAHÂBHÂRATA*). The following are the *Mahâ-kāvya*, or great poems of this class; the *Raghuvans'a* and *Kumârasambhava*, by Kâlidâsa (q.v.);

the *Nalodaya*, also ascribed, though probably wrongly, to the same poet; the *Bhāt'vikārya*, or the poem by Bhāt'vi; the *S'is upilabdhā*, by Māgha, hence also called the *Megha-kārya*; the *Naishadiyacharita*, by S'riharsha; the *Kirātārjunīya*, by Bhārvī; and the *Rāghava-Pān'daviya*, by Kavirāja (i.e., the prince of poets), as the author calls himself.

(c.) *Lyric and Erotic Poetry*.—Several works of this class are more of a descriptive character, and would differ therefore from what in European poetry might be included under this head. The principal works belonging to it are the following: the *Ritusan-hāra*, or a description of the seasons, attributed to Kālidāsa (q.v.); the *Meghadūta*, or the cloud-messenger, also supposed to have been written by Kālidāsa—a poem in which a demigod, separated by fate from his wife, is imagined to make a cloud the messenger to her of his woes, and incidentally, as it were, describes his course over a large tract of India; the *Amarūs'ataka*, or hundred stanzas of Amaru, on amatory feelings and scenes, the natural sense of which commentators have twisted also into one of a mystical character, so as to make them appear less objectionable, especially as they were supposed by some to have been composed by the celebrated theologian Sankara, when he had animated the dead body of king Amāru (see S'ANKARA); these stanzas have an epigrammatic character, and share in this respect the style of the first *S'ataka*, or hundred verses on love, by Bhartr'ihari; the *Bhāmīnīvilāsa*, by Jagannātha Paṇ'ditarāja, in four books, the second of which is connected with amatory subjects, while the third is a beautiful elegy on the death of the poet's wife; the *Gitagovinda*, by Jayadeva, who probably lived in the 12th c., which, in ten sections, describes the amours of Kr'ishn'a with the cowherdesses, his separation from his wife Rādhā, and his ultimate reconciliation with her, and which, like the *Amarūs'ataka*, has also been explained in a mystical sense, Kr'ishn'a then being represented as the soul which, for a time, becomes estranged from the supreme soul, its original source, but finally returns to it. This poem differs from those mentioned before in being intended for singing and for representation at a festival held in honor of Vishn'u; it combines the lyric and the melo-dramatic character.

(d.) *Didactic Poetry*.—A portion of this class of poetry may be included under the former head, since even such works as the *Amarūs'ataka*, and the erotic stanzas of *Bhartr'ihari*, have much of the sententious character; another is contained in the episodes of the *Mahābhārata*, and another forms a considerable portion of the books of fables. The chief special representatives of this class are, "the three *S'atakas*," or hundred stanzas on love, good and wise conduct, and renunciation of worldly desires, by *Bhartr'ihari*. Similar pieces of poetry are the hundred stanzas of *Chānakya*, and some stanzas in the anthology of *S'arṅgadharā*, called the *S'arṅgadharapaddhati*. Others have been collected in various modern anthologies, such as the *Nīṭisankalana* and the *Kavītm-r'itakūpa*. For the poem *Bhagavadgītā*, see under YOGA.

(e.) *Dramas*.—The plays of the Hindus are not numerous; they were only acted on special occasions, and the subject of the plot is with predilection borrowed from the legendary literature of ancient India. Hindu dramatists have little regard for unity of time, place, and action; and with the exception of Kālidāsa, they must be considered as inferior in poetical worth to the renowned dramatic writers of ancient Greece and of modern Europe. Besides the reasons to be sought for in the religious, mystical, and metaphysical tendencies of the Hindu mind, a free development of the Hindu drama was probably also impeded by the heavy and artificial canon which weighed upon Hindu dramaturgy, and which, ascribed to sacred sources, and looked upon as a law not to be transgressed by any dramatic poet, did not allow much scope for poetical imagination, and would keep down any free movement upon which it might have ventured. The various kinds of dramatic performances, the number of their acts, the characters of the plays, the conduct of the plot, the sentiments to be represented, and even the modes of diction—all these were strictly regulated; so much so, that in spite of the differences which must exist between different authors and plays, there is still a kind of uniformity which pervades the whole Hindu drama, and must strike any one unacquainted with this elaborate dramatical canon. It must suffice here to mention a few of its peculiarities. All dramatic composition is divided, according to it, into two great classes—the *rūpaka*, or performance, and the *uparūpaka*, or the minor *rūpaka*; the former containing ten species, from the *nāt'aka*, or the play, *par excellence*, which represents exalted personages, down to the *prahasana*, or farcical comedy; and the latter with 18 species. Neither class contains the species "tragedy"—which is incompatible with a belief in fate, one of the main features of the Hindu mind. Every drama opens with a prelude in the form of a dialogue between the stage-manager and one of his company, in which the name of the author and of his work, and such prior events as the spectators should know, are brought before the audience. The first part of this prelude is a prayer invoking the benediction of some deity in favor of the assembly. The piece thus being opened, is then carried on in the usual manner; but so long as the same act lasts, the stage is never left empty, but the entrance of a new personage is always announced by a special person. The piece closes as it began, with a benediction. The principal characters of the play are the hero (*nāyaka*) and the heroine (*nāyikā*). The former is either *lalita*, gay, thoughtless, and good-humored; or *s'ānta*, gentle and virtuous; or *dhīro-dātta*, high-spirited, but temperate and firm; or *udātta*, ardent and ambitious; but as each of these categories is again subdivided, they become multiplied to 144 kinds.

Equal minuteness is displayed in specifying the classes of the heroines. The hero had his antagonist in the *pratīdyaka*, or counter-hero; and each of these may have his officers, ministers, and friends. The heroine, on her part, has always a confidential companion, who is often her foster-sister. The subordinate characters are described as being eunuchs, mutes, dwarfs, foresters or barbarians. Two characters, however, deserve special notice, as being peculiar to the Hindu stage—the *vi'ta* and the *vidūshaka*. The *vi'ta* may be the companion of a man or woman; he is generally on familiar, yet dependent terms, with his associate, and though somewhat like the parasite of the Greek comedy, yet not rendered contemptible; if a female, she is courtesan. The *vidūshaka* is the humble companion of a prince or a man of rank; he is always lively, sometimes witty, and, according to the definition of his attributes, he is to excite mirth by being ridiculous in person, age, and attire. He is, curiously enough, always a Brāhman. The plays have eight, or, according to some, nine *rasa*, or characteristic flavors: these *rasas* are love, mirth, tenderness, fierceness, heroism, terror, disgust, wonder, and tranquillity; and they again consist of conditions with numerous divisions and subdivisions. The manner according to which the form of speech is regulated, is another peculiarity of the Hindu drama. Only the hero and the principal personages speak Sanskrit, but women—with rare exceptions—and the inferior personages speak Prākṛit, the various, higher or inferior, idioms of that language being adapted to their higher or inferior character. See PRĀKRĪT. The oldest known Sanskrit drama is the *Mṛ'ichehshakal'a*, or "the Clay Cart," by king Sūdraka, which, in the opinion of H. H. Wilson—who translated it in his *Select Specimens of the Theater of the Hindus*—was written in the 1st c. B.C. Of other dramas may here be mentioned *Abhijnānasakuntala* (see S'AKUNTALĀ) and *Vikramorcas'ī*, by Kālidāsa (q.v.), to whom also the drama *Mālavikāgnimitra* is attributed; *Mālatīmādhava*, *Mahavīracharita*, and *Uttararāmacharita*, by Bhavabhūti; *Ratnāvali*, by Śrīharsha; *Mudr'rākshasa*, by Viśākṣadatta; *Hanumann'aka*, fabled to have been composed by the monkey Hanuman (q.v.); and *Anarghar ghava*, by Murāri. A drama of a peculiar nature is the *Prabodhachandrodaya*, by Kṛ'ishn'amis'ra, who, in the opinion of Goldstücker, expressed in the preface to his translation of this drama, lived at the end of the 12th century. Its leading personages are all of a transcendental kind; such as the supreme spirit, faith in Vishnu, volition, organ of imagination, opinion, devotion, quietude, friendship, etc., on the one side; and error, egotism, hypocrisy, love, voluptuousness, anger, avariciousness, etc., on the other; and its object is to represent the victory of the former over the latter. The general dullness of the play is relieved by a number of sectarian worshippers, who appear on the scene, each eulogizing the truth of his own religion, and ridiculing that of his antagonist. That this drama, which would baffle the patience of a European audience, was acted "before king Kirtivarman, who, with his whole assembly, was very eager to see it," the poet relates in the prelude to it. An imitation of this drama is the *Chaitanyachandrodaya*, by Kavikarn'apura. For the translation of several of these dramas, and an account of others, see H. H. Wilson's *Select Specimens of the Theater of the Hindus* (2 vols., London, 1835).

(f.) *Fables and Narratives*.—Fables, as such, occur, and are referred to, as early as in the great epic poems; but the oldest collection of fables is the *Panchatantra* (q.v.); and after it, the *Hitopadeś'a* (q.v.). These works are considered by the Hindus to belong to the class called *nītis'āstra*, or works on conduct and polity, since the morals drawn from the fables, and expressed in sententious verses, with which they are interwoven, are the object for which these collections were made. A different class of writings are the ghost-stories, merely composed for amusement, such as the *Vetālapanchavins'atī*, or the 25 tales of the vampire; and the *S'ukasaptatī*, or the 70 tales of the parrot; and the *Sinhāsanaśatvins'atī*, or the 32 tales of the statues on the throne of Vikramāditya. A work of a higher order is the *Vṛ'ihatkathā*, "the Grand Tale," or *Kathāsaritsāgara*, "the Ocean for the Rivers of Tales," by Somadeva of Cashmere. Among narratives of the romance class, the most celebrated are the *Das'akumāracharita*, or the "Adventures of the Ten Princes," by Dan'din, who lived about the middle of the 11th c., edited, with an elaborate preface, by H. H. Wilson; *Kadambarī*, by Vānabhatta; and the *Vāsavadattā*, by Subandhu, a critical account of which work is given by Fitzedward Hall, in the preface to his edition of it (Calcutta, 1859).

(g.) *Chronicles*.—Historical works, in the European sense of the word, do not exist in Sanskrit literature. The same causes which have clouded all Hindu chronology, and even, at recent periods of Hindu history, have transformed historical facts into myths, seem to have rendered the Hindu mind indifferent to the research and the recording of historical truth. The only approach to historical works is found in some chronicles, though these, also, are not devoid of fictitious narratives. The most renowned among them is the *Rājatarangin'ī* (q.v.), or the Chronicle of Cashmere, by Kalhana. A modern work of a similar kind, but of much smaller extent, is the *Kshit'is'arans'avalīcharita*, or the chronicle of a series of royal families who reigned in Bengal. It was composed in the middle of the last century.

4. *Scientific Literature*.—(a.) *Philosophy*. See the articles SĀNKHYA, YOGA, NYĀYA, VAIS'ESHIKA, MĪMĀNSĀ, VEDĀNTA.

(b.) *Grammar*.—That a scientific study of grammar was cultivated at a very early period of Hindu literature is borne out by the testimony of the oldest glossator on the Vedas, Yāska (see NIRUKTA). The oldest extant work, however, on Sanskrit grammar is pos-

terior to the work of Yāska; it is the grammar of Pān'ini (q.v.), which was criticized by Kātyāyana (q.v.) in the *Vārttikas*, these, again, being commented on and criticized by Patanjali in the *Mahābhāṣya*. (See PĀN'INI, where some of the principal later works connected with his system are mentioned.) That the *Prātisākhya*s (see VEDA) did not precede the grammar of Pān'ini, has been shown by Goldstücker in his *P'nāni, his Position in Sanskrit Literature*, etc. Of authors of grammars, not following the technical system of Pān'ini, the principal are Hemachandra, a Jaina (q.v.) writer, and Vopadeva, who probably lived about six centuries ago, and is especially esteemed in Bengal.

(c.) *Lexicography*.—It consists of glossaries of words and *dhātus*—a term which may be vaguely rendered by “roots,” or “radicals,” though it does not imply to the Hindu grammarian the idea of a linguistic element—and of commentaries on these glossaries. The oldest known glossary of Vedic words—nouns and verbs—is the *Niruktā* (q.v.) of Yāska. Renowned glossaries of classical words are the *Amarakośha*, by Amarasinha, who is probably not later than the 3d c. after Christ; the *Abhidhānatnamālā*, by Halāyudha; the *Haimakośha*, by Hemachandra; and the *Viśvaparakāśa*, by Mahes'wara. (For other works of this class, see Wilson's *Sanskrit-English Dictionary*, preface to 1st ed. 1819; and Colebrooke's *Miscellaneous Essays*, vol. i. p. 50, ff.) The glossaries of *dhātus* are called *Dhātupāṭha*s. The oldest was probably composed by Pān'ini himself, and is the groundwork of the existing works of this name, though the latter contain numerous additions of later forms. The chief commentary on the *Dhātupāṭha* is that by the celebrated Mādhavācārya (q.v.).

(d.) *Prosody*.—Sanskrit prosody admits three sorts of meter: one governed by the number of syllables, and which is mostly uniform, or monoschematic, in profane poetry, but not so in various passages of the Vedas; the other regulated by feet equivalent to two long syllables, or to four short; and the third regulated by the proportion of syllabic instants, without noticing the number of feet. Some Sūtras (q.v.) connected with the Vedas contain rules on the Vedic meters; but the principal work on Vedic as well as profane prosody is the *Chhandah'sāstra*, by Pingala, which has been commented on by various writers, the most conspicuous of whom is Halāyudhabhaṭṭ'a. A short treatise on prosody, which only exhibits the most common sorts of meter, the *Srutabodha*, is attributed, but probably wrongly, to Kālidāsa (q.v.).

(e.) *Art of Poetry*.—It is treated in works on dramaturgy, and works on the poetical art in general. The oldest work on the dramatic art is the *Sātra* of Bharata; a later one is the *Daśarūpa* by Dhnananjaya. Some of the principal works of the latter category are the *Kāvyaprasā*, by Mammat'a, the *Kāvyaḍars'a*, by Daṇḍ'in, and the *Sāhityadarpan'a*, by Viśwanātha Kavirāja. Several other works of this class are especially concerned in the explanation of figures of speech.

(f.) *Works on Music*.—In general, they treat of notes, musical scales, melodies, the art of singing, and musical instruments; and some of them also of the art of dancing and performing. The melodies, or *Rāgas*, are represented as deities, who have wives, the *Rāginīs*. Their number is uniform in the different works, and it is probable that the passages in dramas and other poetical works intended for singing were written to suit these fixed melodies, and not that the melodies were composed after the poet had performed his task. The principal works of this kind are the *Saṅgītaratnākara*, by Śārṅgadeva, the *Saṅgitadarpan'a*, by Dāmodara, and the *Saṅgitadāmodara*, by Śubhankara. Special treatises relate to the melodies alone.

(g.) *Amatory Art*.—Works treating of this art purport methodically to explain and to classify all that relates to love, and they refer for many of their statements to the oldest authorities. The chief work on the subject is the *Kāma-Sātra* of Vātsyāyana.

(h.) *Astronomy and Arithmetic*.—The calendars connected with the Vedas are the earliest evidence of Hindu proficiency in astronomy; they presuppose a knowledge of a solar year of 365 days, and their date is assumed by Colebrooke to belong to the 13th c. B.C., while others would place them a few centuries later. The scientific works of later Hindu astronomers are professedly based on five ancient systems, or Siddhāntas, called the Pauliś'a-, Romaka-, Vās'isht'ha-, Saura-, and Paitāmaha-Siddhānta; and the earliest renowned author among these astronomers is Aryabhaṭṭ'a, who, according to Colebrooke's calculation, did not live later than the 5th c. after Christ. From the quotations by Brahmagupta, it appears that Aryabhaṭṭa “affirmed a diurnal revolution of the earth on its axis, that he possessed the true theory of the causes of lunar and solar eclipses, and that he noticed the motion of the solstitial and equinoctial points, but restricted it to a regular oscillation, of which he assigned the limit and the period.” See, for further detail, Colebrooke's *Algebra*, etc. (Lond. 1817, p. 38). His principal work, the *Argasht'as'ata*, is at present only known from the quotations of Brahmagupta, Bhaṭṭ'otpala, and others; but his other works, the *Daśagūṭikā* and *Aryabhaṭṭ'iya*, are extant. Varāhamihira, the next important astronomical writer, a native of Ujjayini, lived about the beginning of the 6th c. after Christ. His compilation of the five Siddhāntas, the *Panschasiddhāntika*, is not yet recovered; but several of his astrological treatises, and the scholia on them by Bhaṭṭ'otpala or Utpala are preserved, and his *Br'hatṣaṇhitā* has been recently edited by Dr. H. Kern (Calc., 1865). Another great astronomical authority is Brahmagupta, who appears to have written toward the close of the sixth, or the beginning of the following century; his work bears the title of *Brahmasiddhānta*, and it was followed up by Bhāskara, who, in the middle of the 12th c., composed a celebrated work, the

Siddhântas'iroman'i, translated by Lancelot Wilkinson (Calc., 1861). The *Sûryasiddhânta* has been edited by Fitzedward Hall (Calc., 1859); and two translations of it are due, one to E. Burgess, in the *Journal of the American oriental society*, accompanied with notes by Whitney (New Haven, 1860); another to Bâpûdeva Sâstri (Calc. 1861); but whether this Siddhânta is the Saura, one of the five original Siddhântas above mentioned, or a later work bearing a similar title, is matter of doubt. That Hindu astronomy is largely indebted for its progress to the kindred sciences of western nations may be inferred from the occurrence in Sanskrit of terms which are of Arabic and Greek origin. Thus, the terms *horâ*, *dreshkân'a*, *lîpta*, *kendra*, etc., are easily traced to the Greek *hōra*, *dekunos*, *lepta*, *kentron*, etc.—That works on Hindu astronomy contain more or fewer chapters or passages which no longer concern astronomy, but belong to the sphere of astrology, can be no matter of surprise, considering the intimate connection in which, in India, religion and superstition stand to every branch of human knowledge, and much more especially to one concerning the heavenly bodies. There are, moreover, numerous works which are purely astrological, merely treating of nativities and the influence of the planets on certain periods of the day or month, and the occurrences that would take place at them. Among celebrated writers on algebra, it must here suffice to name Varâhamihira and Bhâskara. See Colebrooke's *Algebra*, as quoted above.

(i.) *Medicine*.—The origin of Hindu medicine is referred to the god Brahman, from whom the Ayurveda, or "the science of long life," was obtained by Daksha, who communicated it in his turn to the As'wins. Some time after this, mankind, in consequence of their wickedness, becoming afflicted with numerous diseases, the Munis, or saints, met in the Himalaya mountains to search for a remedy. A long list of these saints is given by *Charaka*, one of the greatest medical writers, and it is so far of interest as it contains several names known in Hindu history, and which thus may be probably connected with the early study of Hindu medicine. The two greatest medical authorities the works of whom are still extant are *Charaka* and *Sus'rûta* (q.v.). Both treat of the duties of physicians and their pupils, of anatomy and physiology; hygeology; materia medica, pharmacy, and preparations of medicine; surgery; the diagnosis, prognosis, and treatment of a considerable number of diseases; midwifery, toxicology, etc. Several chapters in them are devoted to omens and portents, as well as to the evil influence of planets and demons on the human body. *Charaka*, who is older than *Sus'rûta*, contains more mythological detail than the latter.

(j.) *Architecture*.—Treatises on architecture, sculpture, etc., are collectively called *Silpas'âstra*. There appear to have been 32, or, according to some, 64 standard treatises on these arts, but of these only a few are probably still in existence. The most important of them is the *Mânasâra*, which consists of 58 chapters, each of which is devoted to a particular topic—such as measures used in architecture; the different sites to be selected for building temples and houses; the mode of determining the different points of the compass; the several sorts of villages, towns, and cities, with directions for building them; the different parts of an edifice, its ornaments, pedestals, bases, pillars, etc.; the various sorts of temples; the construction of porticoes, gates, palaces, etc.; the construction of images, and cars in which the gods are carried in procession, together with the ceremonies attending the consecration of images; the mode of determining the propitious moment for commencing to lay the foundation of an edifice, etc. See, for further detail, Râm Râz, *Essay on the Architecture of the Hindus* (London, 1834).

For a more copious supply of titles of books on the subjects mentioned, the reader may consult Gildemeister, *Bibliotheca Sanskrita*, Bonn (1847), and the printed catalogues of the library of the India office, of the Sanskrit MSS. of the Bodleian library at Oxford, and of the Sanskrit MSS. of the royal library at Berlin; also Müller, *History of Sanskrit Literature*; Wheeler, *History of India*; Williams, *Indian Wisdom*; Whitney, *Oriental and Linguistic Studies*; Wilson, *The Hindu Drama*; Alger, *Oriental Poetry*; Müller, *Sacred Books of the East*, and the translation by Protapa Chandra Roy of the *Mahabhârata* still appearing in numbers. The best Sanskrit Grammar in English is that of Prof. W. D. Whitney (2d ed., 1890); the best Lexicon is the great *Wörterbuch*, published at St. Petersburg in 7 vols., by Böhrlingk and Roth.

SANSON, NICOLAS, 1600–67; b. Abbeville, France; educated at the Amiens Jesuit college. In 1616 he made a map of ancient Gaul. He engaged in business, but with little success, and in 1627 visited Paris, where he attracted the notice of Louis XIII., and became his instructor in geography. By him he was made engineer of Picardy, and later, geographer to the king and councillor of state. His maps were not remarkable for accuracy, but he has the honor of being the creator of French geography.

SAN STEFANO, TREATY OF—so called because signed at San Stefano, a suburb of Constantinople—was the treaty of peace between Russia and Turkey in March, 1878. It contained twenty-nine articles, the principal provisions being the independence of Montenegro, Servia, and Roumania, and the settlement of affairs in Bulgaria. See BERLIN, TREATY OF.

SANTA ANNA, or ANA, a t. of Central America, in the state of Salvador, and 36 m. n.w. by w. from the town of San Salvador. The town is nearly as important as the capital, controls the sugar trade and is in one of the most fertile regions of the republic. It is on the main road from San Salvador to Guatemala and has a railroad line to Acajutla. There are iron, copper, silver, and zinc mines. Pop. about 22,000.

SANTA ANNA, DON ANTONIO LOPEZ DE, ex-President of Mexico, was born in Jalapa, in 1795. While a mere youth he entered the Spanish army, and became lieut.col. in 1821. When Mexico determined to throw off the Spanish yoke, Santa Anna greatly distinguished himself at the head of the Mexican troops. The Spanish royalists were expelled from Vera Cruz, and he was elected governor of the city and province. Iturbide had established an imperial rule over Mexico (q.v.), but his tyranny having worked his downfall, Santa Anna proclaimed in 1822 a Mexican republic, which was recognized by every foreign state except Spain. He was incessantly engaged in quelling the civil wars kindled by the aristocratic and democratic factions. In 1829 he engaged and put to flight a division of Spanish troops which invaded Mexico by way of Tampico, with the view of again bringing Mexico under Spanish rule. The separation of Texas (q.v.) from the Mexican union was vigorously but unavailingly opposed by Santa Anna. In 1837 differences arose with France, and a division of French troops landed at Vera Cruz. They were gallantly engaged by Santa Anna, who drove a portion of them into the sea at the point of the bayonet. In this action he received a bullet in the leg, which rendered the amputation of the limb necessary. In 1838 the French took Vera Cruz, and obtained the settlement of their differences. In 1847 war having been declared by Mexico against the United States, Santa Anna took the command of the Mexican forces. He offered a gallant but ineffectual resistance to the troops of Generals Scott and Taylor. The city of Mexico having been stormed and taken by the Americans under Gen. Scott, the war was at an end, and Santa Anna retired from Mexico. During 30 years he had disputed the direction of affairs with Bustamente, Herrera, Cevallos, and other chiefs of parties, being at one time dictator, and at another disgraced and an exile. In 1853 Mexico, torn by civil dissensions, and falling into anarchy, again recalled Santa Anna. He declared himself president for life, and a civil war was the immediate result. In 1855 he was driven from the country. During the government of Juarez, 1858-63, Santa Anna was looked up to as their chief and future ruler by an influential party in Mexico. On the establishment of a hereditary monarchy under Maximilian of Austria as emperor, Santa Anna returned to Mexico, having first signed an act of adhesion to the empire. He soon, however, began to intrigue for his own return to power, issuing addresses to the people as emperor, and was ordered to leave the country. After some residence in the United States, Santa Anna planned an expedition against Juarez; but he was taken prisoner before landing at Vera Cruz. He was condemned to death, but pardoned by Juarez, on condition of his leaving Mexico. On the death of Juarez in 1875 he returned to Mexico, where he died in 1876. He was regarded by his countrymen as their ablest general, and he was more successful than any other Mexican ruler in quelling the miserable civil wars, though he sometimes showed unjustifiable cruelty. He was also accused of being greedy of wealth, and unscrupulous in the means of obtaining it. He received the grand cross of Charles III. of Spain, and the grand cross of the Red Eagle of Prussia.

SANTA BARBARA, a co. in s.w. California, having the Pacific ocean on the s. and w., the Guaymas river on the n., comprising several islands on the coast; area, 2380 sq. m.; pop. '90, 15,754, chiefly of American birth, with colored. It is drained by the Santa Clara and Santa Inez rivers. Its surface is crossed in the e. by the Sierra San Rafael and the Sierra Santa Inez; in the w. it is less hilly; throughout its entire extent the low land and river banks are fertile, producing grain, potatoes, dairy products, oranges, and all tropical fruits, and grapes which are made into wine and raisins. The climate is warm and mild, and the rainfall is slight from May to November. Orchards of mulberry trees have been planted, and large numbers of cattle are raised. Its mineral products are asphaltum, largely exported, salt, petroleum, sulphur, copper, and iron. Gold is found. Co. seat, Santa Barbara.

SANTA BARBARA, city and co. seat of Santa Barbara co., Cal.; on Santa Barbara channel and the Southern Pacific railroad; 362 miles s.e. of San Francisco. It is in an agricultural, stock-raising, and wool and fruit growing region, and is widely noted as a midwinter health resort, because of its equable climate. It has a high school, collegiate institute, public, high school, and natural history libraries, electric lights, electric street railroads, regular steamboat communication with San Francisco, San Diego, and San Pedro, national and state banks, numerous mineral springs, and daily and weekly newspapers. In the suburbs is the Spanish mission established by Junipero Serra in 1786. Pop. '90, 5864.

SANTA CATHARINA, a province in Brazil, bounded e. by the Atlantic, and on the other three sides by the provinces of Paraná and Rio Grande do Sul; 27,436, sq. m.; pop. '90, 259,802. Except on the coast, which is low, the surface is mountainous, traversed by the Serra Catharina on the w., and well watered. On account of the mildness of the climate, fertility of the soil, and beauty of the scenery, it is called "the paradise of Brazil." The principal productions are cotton, vanilla, wine, sugar, coffee, and silk. Beds of bituminous coal have been found. There are German colonies in the province. Off the coast, separated by a strait, is the fortified island of Santa Catharina, 34 m. long, 3.5 m. broad, forming the fine bay of the same name. On the w. side of the island is Desterro, the capital of the state.

SANTA CLARA, a co. in w. Cal., bordered on the n. by San Francisco bay, and crossed by several branches of the Southern Pacific railroad, drained by the Guadalupe river, Coyote creek, and other streams; 1380 sq. m.; pop. '90, 48,005, includ. Chinese. The beautiful and fertile valley of Santa Clara, which is 20 m. wide, forms the greater part of the county, and lies between the coast and Santa Clara mountains, the highest point of which is Mount Hamilton, 4449 ft. high. The valley is furnished with water from nearly 1000 artesian wells; the climate is uniform, and there is abundance of good fruit. The principal productions are lumber, grain, hay, wine, cattle, wool, and hops. It contains asphaltum, copper, petroleum, mineral and hot springs, and the New Almaden quicksilver mine, 2300 ft. deep, the richest in the world, excepting that of Almaden in Spain. It has manufactories of tanned and curried leather, carriages, wagons, machinery, paper, saddlery, harness, tin, copper, and sheet-iron ware; flour, planing, and saw-mills; and establishments for smelting quicksilver. Co. seat, San José.

SANTA CLAUS. See **NICHOLAS, SAINT.**

SANTA CRUZ, a co. in w. Cal., bounded by the Pacific ocean and Monterey bay on the w., on the e. by Santa Cruz mountains, and on the s. by Pajaro river; crossed by the Southern Pacific railroad, and drained by the San Lorenzo and Sequoia rivers; 425 sq. m.; pop. '90, 19,270. The surface is mountainous and heavily wooded with oak, pine, and redwood trees of large growth, the redwood often attaining the size of 15 ft. in diameter. The soil in the valleys is fertile, and large crops are raised. The main productions are grain, potatoes, wine, butter, and cattle. It contains copper, limestone, petroleum, gold, and sand that is used in making glass. It has good water-power, and there are manufactories of gunpowder, barrels, lime, saddlery and harness, engines and boilers, tin, copper, and sheet-iron ware, tanned and curried leather, flour, planing and saw-mills. Sardines and other fish are abundant in the bay. Co. seat, Santa Cruz.

SANTA CRUZ, city and co. seat of Santa Cruz co., Cal.; on Monterey bay, the San Lorenzo river, and the Southern Pacific railroad; 80 miles s. of San Francisco, with which it has regular steamer communication. It occupies a beautiful and sheltered site on the n. side of the bay, and is one of the principal watering-places of California. It has a high school, the school of the Holy Cross (R. C.), public library, several public parks and squares, state banks, electric light and street railroad plants, waterworks, more than a dozen churches, and daily, weekly, and monthly periodicals. The industries of the city and vicinity comprise farming, stock-raising, dairying, fruit and vine growing, and the manufacture of bitumen, lumber, leather, paper, powder, and lime. Pop. '90, 5596.

SANTA CRUZ (Teneriffe), the capital of the Canary islands (see **CANARIES**), and their chief seaport, stands on the n.e. side of the island of Teneriffe. Its port, the safest in Canaria, has recently been extended and improved. The streets of Santa Cruz are broad, the houses whitewashed and flat-roofed, and several of the public buildings striking in appearance. The town is defended by several forts and redoubts. Formerly large quantities of wine of excellent quality were grown in Teneriffe, and shipped for export at Santa Cruz; now, however, the principal articles of export from this, and also from the other islands, are brandy, tobacco, agricultural produce, and cochineal. Coal from England, together with manufactured goods, hardware, and furniture are imported. Pop. commune, '87, 16,610.

SANTA CRUZ. See **VIRGIN ISLANDS.**

SANTA CRUZ DE LA PALMA, the capital of Palma, one of the Canary islands (q. v.). It stands on the e. coast of Palma, on a spacious bay. Pop. commune, about 6700.

SANTA FÉ, a prov. in the Argentine republic, on the w. bank of the Rio Paraná, separating it from Entre Rios; bounded by Buenos Ayres, Cordova, Corrientes, and Santiago; 18,000 sq. m.; pop. '95, 397,285. The climate is healthy. There are flour mills and a variety of other manufactures. The finances are in a bad way. It is drained by the Rio Salado and the Tercero. In the s. are level plains rising into hills in the n., and diversified by salt lakes. Much of the country is occupied by extensive forests; in the cultivated portions, wheat, maize, tobacco, wax, honey, and tropical fruits are produced. Capital, Santa Fé.

SANTA FÉ, a co. in n. central New Mexico; drained by the Rio Grande and its branches, and the Pecos; about 2292 sq. m.; pop. '90, 13,562, chiefly of American birth. The surface is mountainous, and heavily wooded. The soil is fertile in the Rio Grande valley, but on the high table-lands sterile and uncultivated. Co. seat, Santa Fé.

SANTA FÉ, a t. of the Argentine republic, capital of the province of Santa Fé on the right bank of the Paraná, 250 m. n.w. by n. from Buenos Ayres. Pop. '96, 22,244.

SANTA FÉ, city, capital of New Mexico, and co. seat of Santa Fé co., on Santa Fé or Rio Chiquito creek, and the Atchison, Topeka, and Santa Fé and the Denver and Rio Grande railroads; 20 miles e. of the Rio Grande. Both Santa Fé and St. Augustine, Fla., claim to be the oldest settlement in the United States, and in evidence of Santa Fé it is asserted that the place was a populous Indian pueblo, or town, as early as 1541; that the first church built in the United States, San Miguel, was erected here in 1550; and that the first cathedral of San Francisco, now partly contained in the modern building, dates from 1622. The building known as the governor's palace, which has been used continuously as the headquarters of the chief executive, was built in 1598. The city lies at the

foot of a spur of the Rocky mountains, at the elevation of 6939 feet above sea-level; has narrow and crooked streets; and is built up generally with adobe, the business structures and the governor's palace being on the sides of a public square, containing a Soldiers' monument. The city has a U. S. government building, capitol of cream sandstone, court-house, penitentiary, New Mexico school for the deaf and dumb, the university of New Mexico (Cong.), St. Michael's college (R. C.), Loretto academy, Presbyterian academy, the Ramona industrial school for Indian girls, St. Catharine's school for Indian boys, St. Vincent's hospital, Roman Catholic orphan asylum, and the Roman Catholic cathedral of San Francisco de Asoissi. There are public and private schools, churches and missions of the principal denominations, national bank, electric lights, and water-works supplied from a reservoir three miles above the city. The valley lands within a radius of 30 miles from the city are highly adapted to farming and fruit culture, and these industries are carried on extensively. There are also large gold and silver-mining and stock-raising interests. Pop. '90, 6185.

SANTALACEÆ, a natural order of exogenous plants, mostly trees and shrubs. The leaves are undivided, sometimes minute. The perianth is superior, 4 to 5 cleft. The stamens are 4 or 5, opposite the segments of the perianth, and inserted into their bases. The ovary is one-celled, with one to four ovules. The fruit is one-seeded, nut-like, or drupaceous.—There are about 110 known species, natives of various parts of the world, the European and most of the North American species being obscure weeds, while the trees of the order occur chiefly in the East Indies, New Holland, and the South Sea islands. Sandalwood (q.v.) is the produce of plants of this order. The leaves of *Osyris Nepalensis* are used for tea. Some species are used in medicine in their native countries. *Fusanus acuminatus* is the quandang nut of New Holland. Its taste and qualities resemble those of sweet almonds, as do also those of the seed of the *Cervantesia tomentosa* of Peru. *Pyrularia oleifera*, the buffalo tree or oil-nut, has a large seed, from which, in the southern states of America, oil is obtained.

SANTALINE, or **SANTALIC ACID**, the coloring matter of *Pterocarpus santalinus*, or red sandalwood, is readily obtained by digesting the rasped wood in alcohol, and then precipitating the santaline by the free addition of water. It is little used in this country as a dye-stuff, but it is employed in India both in dyeing silk and cotton. It is in consequence of the santaline contained in it that red sandalwood is retained in the *pharmacopœia* as a coloring agent for tinctures, etc.

SANTA MARGARITA, a t. of Spain, in the Balearic Islands, 26 m. e.n.e. of Palma. Pop. about 4000.

SANTA MARGHERITA DI BELICE, a commune of Sicily, in the province of Girgenti, with 7500 inhabitants.

SANTA MARGHERITA DI RAPALLO, a pleasant t. in the province of Genoa, Italy, situated on the sea-coast about 15 m. e.s.e. of the city of that name. The Genoese coral fishery is carried on principally by feluccas fitted out here, and manned by the bold seafaring population. The town is much frequented for sea bathing. Pop. '81, 3632.

SANTA MARIA, a city in s. Spain, in the province of Cadiz; on the bay of Cadiz, 22 m. n.e. of the city of that name, near the mouth of the Guadalete river; pop. '87, 20,590. It is 7 m. by rail from Jerez, and receives its wine for exportation. Its manufactures include brandy, liqueurs, leather, soap, oil, hats, wax, etc.

SANTA MARIA DI CAPUA-VETERE, a city of s. Italy, in the province of Caserta, with, '81, 11,291 inhabitants. It is not handsome but new, and its population increases every year. It was formerly considered the key to Naples. It is on the railroad from Naples to Rome. It has a fine old cathedral, a college, and convent.

SANTA MARTA, a t. of the United States of Colombia, the capital of the province of Magdalena, on a bay of the Caribbean sea, in lat 7° 15' n., long. 74° 14' w. There is a good harbor, defended by a castle and several batteries. Pop. about 6000.

SANTA MAURA, or **LEUCADIA** (anc. also *Leucadia* and *Leucas*, so called from its white cliffs), one of the Ionian islands, off the w. coast of the ancient Greek province of Acarnania, from which it is now separated by a passage about a mile wide, although it was in early times connected with the main-land by an isthmus. The canal across the isthmus, which converted the peninsula into an island, is said to have been cut by the Corinthians. Santa Maura is about 22 m. long, and has a breadth ranging from 6 to 9 miles. Area about 180 sq. m.; pop. '89, 24,914. Its surface is very uneven. It is traversed by a range of hills from north to south, which end at the southern extremity in the high white cliffs called by the Italian sailors of the Levant cape Ducato (a corruption of *Leucates*), but better known under the name of "Sappho's Leap."

SANTANDER, a state in the United States of Colombia; bounded on the n.e. by Venezuela, and on the w. by the Magdalena river; 16,409 sq. m.; pop. '86, 555,600. There is some mining. Capital, Bucaramanga.

SANTANDER, a prov. of Old Castile, Spain, lying on the bay of Biscay, and adjoining the provinces of Biscay, Burgos, Palencia, Leon, and Asturias; 2113 sq. m.; pop. '87,

244,274. The surface is hilly, being on the n. slope of the Cantabrian mountains, but there are many fertile valleys. Agriculture is flourishing and there is a variety of manufactures. There are some mines. The people are extensively engaged in fishery. Capital, Santander (q. v.).

SANTANDER, an important and thriving sea-port of Spain, in the modern province of the same name, stands on a magnificent bay, an inlet of the bay of Biscay, about equally distant from Oviedo on the w., and San Sebastian on the east. The bay on which the town is placed is from 2 to 3 m. wide, and about 4 m. long, and is accessible to the largest vessels at all times of the tide. The town is divided into two parts, the upper and lower town, the latter being the more modern and having the chief streets. There are a number of manufactures, including tobacco, cigars, paper, etc. The Spanish colonies and South America can claim about one-half of the trade. The climate is very healthy. Considerable fishing is carried on. The situation of the town, on a headland protected by a hill, is picturesque; among its edifices few are either interesting from their appearance, or important from their character. Numerous new houses, and handsome warehouses, and commercial establishments of various kinds, have been erected recently. The fine harbor of Santander, with a commodious entrance, is accessible at all tides, and unobstructed by a bar. Several important improvements have recently taken place here. The half of the province of Santander may be said to be impregnated with iron, copper, zinc, and other ores; though hitherto the timidity of native capitalists has rendered the quantity extracted comparatively small. Wheat is an important element in the trade of Santander. Of the imports, the chief articles are—sugar from Cuba; textile fabrics from England, France, Belgium, and Germany; and salted codfish from Norway. A railway runs s. from Santander to Venta de Banos on the Great North of Spain railway; and in the middle portion of it, from Barcena to Reinosa, a distance of 21 m., there are many tunnels. Pop. '87, 41,829.

SANTAREM', an interesting old t. and river-port of Portugal, capital of the province of Santarem, on the right bank of the Tagus, 46 m. n.e. of Lisbon by railway. It carries on an active trade in the products of the fertile vicinity with Lisbon, with which there is steam communication by river as well as by rail. Pop. about 7000.

SANTA ROSA, a co. in w. Florida, bordering on Alabama, with the gulf of Mexico on the s., and Escambia river on the w., and drained by Yellow and Blackwater rivers; 1296 sq. m.; pop. in '90, 7969. The surface is level and mostly covered with forests of pine; the soil is poor. The island of Santa Rosa, in the gulf of Mexico, is a part of the county, and is situated at the entrance of Pensacola harbor, which is defended by fort Pickens, which stands on the western extremity of the island. Lumber is the chief export. The main productions are Indian corn, rice, molasses, cattle, and swine. Co. seat, Milton.

SANTEE', a river of South Carolina, which rises in the Blue Ridge, in North Carolina, by two principal branches, the Congaree and Wateree, uniting at the s.e. extremity of Richland co., and empties into the Atlantic ocean. It is 150 m. long, and is bordered, in its lowest course, by rice-swamps and pitch-pine forests.

SANTERRE. ANTOINE JOSEPH, a French revolutionist, who for some time exercised an influence quite disproportioned to his feeble abilities, was b. at Paris, Mar. 16, 1752. He followed the trade of a brewer in the faubourg Saint-Antoine, and his wealth, probity, and generosity toward his *employés* gave him an immense influence in the district. On the establishment of the national guard in 1789 he received the command of a battalion, and took part in the storming of the bastille. During the year 1792 the Jacobin agitators of the faubourgs often met in the brewery of Santerre, and it was there that the *émeute* of June 20 was preconceived, on which occasion Santerre, along with Saint-Huruge, marched at the head of the mob who invaded the *assemblée nationale*, and turned out the Girondists. He also played a conspicuous part on Aug. 10, when he was invested with the dignity of gen. commanding of the national guard. In October he was named field-marshal (*maréchal de camp*), and in April, 1793, he got the "authorities" to let him off scot-free for a debt of some 50,000 livres, which he owed the exchequer in the shape of taxes on the beer manufactured by him—the minister of finance arguing that, inasmuch as Santerre's beer was drunk for the most part by "patriots" (not always careful to pay their score), it ought not to be subjected to "duty." But greater things were yet in store for the privileged brewer. On July 30 he was appointed a gen. of division in the French army, and wishing to do something to justify this strictly military office, he marched at the head of 20,000 men against the Vendéan royalists, but was miserably beaten, and in consequence recalled. Shortly after, he was arrested and imprisoned, and only obtained his liberty after the death of Robespierre. He then withdrew into private life; but his fortunes and his popularity alike declined, and in 1800 we find him begging money and employment from Bonaparte. The latter, who saw clearly enough that Santerre was intrinsically an incapable fool, declined to employ him, but restored him to his military rank. Santerre died Feb. 6, 1809. Owing to the calumnies of royalist writers, Santerre commonly figures as one of the ferocious monsters of the revolution. There is positively no evidence, however,

for such an opinion. Though he was hugely fond of "brave words," and menaced his opponents with all the bellicose grandiloquence of a French revolutionist, he was nearly as soft in the heart as in the head. Some witty contemporary made the following epitaph on him:

Ci-gît général Santerre,
Qui n'eut de Mars que la bière.

SANTIAGO, the largest of the Cape Verd islands (q.v.).

SANTIAGO, a province in central Chile; bounded on the e. by the Argentine republic, on the w. by the Pacific; drained by the Mapu river; 5,223 sq. m.; pop. '95, 410,437 (est.). The surface is mountainous, intersected by the Andes. The soil in the lowlands is fertile. Many cattle are raised, and agriculture is advanced. Silver and copper mines are worked. Capital, Santiago.

SANTIAGO, or **SANTIAGO DEL ESTERO**, a province in the central part of the Argentine republic; bounded on the n. by Tucuman, on the e. by El Gran Chaco, on the s. by Cordova, and on the w. by Catamarca; drained by the Salado, Dulce, and other streams; about 31,500 sq. m.; pop. '95, 160,445. The surface is mountainous in the w., level in the east. There are many lakes and large forests. The climate is warm, but healthful. The soil is fertile. The principal productions are corn, wheat, lucerne, wine, maize, cotton, tobacco, and sugar. Much of the soil is pasture land. There are some manufactures. Capital, Santiago.

SANTIAGO DE CHILE, capital of the republic of Chile, and of the province of Santiago, and the most populous city on the Pacific coast of South America, stands at the western base of the Andes, 1840 ft. above sea-level, and 60 m. e.s.e. of Valparaiso. It was founded in 1541 by Pedro de Valdivia, but it has only recently acquired importance. Its climate is delightful; the plain on which it stands is extensive, and fertile in vines, figs, melons, and other fruits, and the scenery, looking toward the range of the Andes, is of the grandest description. The valley or plain of Santiago is sprinkled with tasteful villas and well-cultivated farms. The city is arranged in squares, and the houses are generally low, and are built around a court or garden, which is intended as a place of refuge during the earthquakes that frequently occur here. But of late years it has become the fashion, in spite of the earthquakes, to build costly houses of two, three, and even four stories, with a façade toward the street. The Alameda, shaded with poplars, and cooled by two streams of running water, is a pleasant promenade. The mint, a portion of which serves as one of the president's palaces, and as offices for the ministers, the Hall of Congress, the opera house and Exposition Hall are fine buildings. The university comprises the five faculties of philosophy, mathematics and physical sciences, medicine, law, and theology. There are important educational institutions (including a normal school), and a library and museum. On the west side of the great square, which is adorned with a fine fountain, is the cathedral. On Dec. 8, 1863, one of its churches, that of La Compania, was destroyed by fire during service, and 2000 out of the 3000 of the congregation—the victims being mostly women—met a dreadful death. Gold, silver, and lead are exported, and the imports are chiefly manufactured goods, wines, and spirits. The chief trade is with Valparaiso by the Valparaiso and Santiago railway, opened in 1863. Pop. '95, 250,000.

SANTIAGO DE COMPOSTELLA, an important and once famous city of Spain, in the province of Corunna, and, from the number of pilgrims by whom it was annually visited, the Mecca of Spain, is extremely picturesque in appearance, from its hill-girt situation on an irregular uneven site, 33 m. s.w. of Corunna. The cathedral, occupying the site of a former edifice of the same nature, was founded in 1082, and its buildings, comprising a cloister, the archbishop's palace, etc., cover more than 3½ acres. The great square is a spacious area, and occasionally used as a bull arena. In front of the town-house is an equestrian statue of Sant Jago (St. James the elder, the patron saint of the city and of Spain), whose body, according to a monkish legend, was discovered near this by a hermit—a star miraculously pointing out the spot, whence the name Compostella (*campus stellæ*, "field of a star"). It was removed to Santiago in 829. The bones of the saint are believed by the people to be built into the foundations of the cathedral. A desolate appearance is imparted to the town from the number of tenantless and ruined nunneries and convents which it contains. Leather, silk, wine, and paper are manufactured, and cereals, vegetables and fruit are grown. Pop. '87, 24,300.

SANTIAGO DE CU'BA, formerly the capital of the island of Cuba, and now the chief t. of the eastern department of the island, stands on a bay on the s. coast at the mouth of a stream of the same name. Its harbor is deep, well protected, and fortified. The houses in the town are mostly but one story high, on account of earthquakes. There are a cathedral, however, and several other churches, a convent and many benevolent institutions and schools. It communicates by railway and telegraph with the other towns of the island. It is the seat of a bishop and of a governor. Sugar, rum, cocoa, coffee, tobacco, and copper ore are exported. Pop. '91 (of district), 71,307; of city proper, about 40,000.

SANTILLANA, MARQUIS DE. See MENDOZA.

SANTLEY, CHARLES, b. Liverpool, Eng., 1834, baritone singer of high reputation. He studied singing in Italy, and appeared on the stage first in 1857. In 1859 he married Gertrude, daughter of John Mitchell Kemble. He appeared with great success in Australia in 1889-90, and in the Cape Colony in 1893. He published *Student and Singer* (1892).

SANTO DOMINGO. See DOMINGO, SAN or SANTO; DOMINICAN REPUBLIC, HAYTI.

SANTONINE, $C_{15}H_{18}O_3$, is a vegetable principle possessing slightly acid properties, obtained from the seeds and flower-heads of several species of *artemisia*. The British Pharmacopœia gives *santonica*, "the unexpanded flower-heads of an undetermined species of *artemisia*," imported from Russia, as its source. It is one of the most efficacious of the class of medicines known as anthelmintics or vermifuges, the most obstinate cases of ascariides and lumbrici almost always yielding to its prolonged use. Pure santonine may be given in powder combined with scammony or rhubarb, the dose being from half a grain to two grains, according to the age of the child. The French prescribe it in the form of lozenges made with white sugar and mucilage; they are readily obtained in this country, and usually act satisfactorily. Küchenmeister, one of the highest authorities on the subject of intestinal worms, prefers the use of santoninate of soda, which he obtains by digesting an alcoholic solution of santonine with carbonate of soda, evaporating and crystallizing. The dose is from two to eight grains mixed with sugar. Two very peculiar symptoms occur after the administration of santonine. The urine often acquires a reddish tint, which may give rise to an unfounded suspicion of the presence of blood in that fluid; and under its influence, vision becomes remarkably affected for a few hours, every object appearing either yellow or green to the patient. No satisfactory explanation of the latter phenomenon has yet been given.

SANTORIN. See THERA.

SANTOS, one of the chief ports of the province of São Paulo (q.v.) in Brazil, 35 m. s.e. of the city of São Paulo, of which it is the port. It stands on the northern side of the island of Engua Guacu, and commands a fine bay. Sugar, coffee, and other products of the interior are transported to Santos by troops of mules; and salt, flour, and other imported goods find their way back by the same means. It is connected with São Paulo by a railway line, which ascends the Serra do Mar to a height of 2500 ft. Pop. stated at 8000.

SAN VICENTI. See SAN SALVADOR.

SÃO FRANCISCO, a large river of Brazil, rises as the Paraneba, in the province of Minas Geraes, in lat. about $20^{\circ} 30'$ s.; long. $43^{\circ} 25'$ west. It flows n., n.e., and e., and in its lower course it separates the provinces of Bahia and Sergipe from Pernambuco and Alagoas. Its first considerable affluent is the Rio das Velhas, which joins it from the right in lat. $17^{\circ} 45'$ south. Above the junction of the Velhas, at Pirapora, where the river is 1782 ft. broad, and 1700 ft. above sea level, there is a fall of 17 feet. From the mouth of the Velhas (1666 ft. above sea level) to the falls of Paulo Affonso the river is navigable for 920 m.; and from these falls to the mouth of the river, a distance of about 140 m., it is navigable for larger vessels and steamers. Its entire length is about 1800 m., and its breadth at its mouth is 3486 feet.

SAÔNE, a river of France, an affluent of the Rhône (q.v.), rises in the dep. of Vosges, at Vioménil, in the Faucelles mountains, at the height of 1476 ft. above sea level, and flows s. past Gray, Châlons, and Macon to its confluence with the Rhône at Lyons. Entire length, 300 m., of which 232 m. are navigable.

SAÔNE-ET-LOIRE, a dep. of France, bounded on the e. by the dep. of Jura and the river Saône, and on the w. by the dep. of Nièvre and the river Loire. Area, 3,302 sq. m.; pop. '96, 621,337. The country consists for the most part of vast and fertile plains, separated by rich vine-clad hills. The fertility is greatest in the vicinity of the two main streams. Horses of a small but vigorous breed are reared. The most important cereals are wheat and oats. Some coal is found. A large variety of iron articles is manufactured.

SAÔNE, HAUTE, a dep. in the n.e. of France, bounded on the n. by the dep. of Vosges, and on the e. by that of Haut-Rhin. Area, 2062 sq. m.; pop. '96, 272,891. About one-half of the entire area is in cultivable land, and more than a fourth part, comprising the n. and n.e. districts, is covered with forest-clad mountains. In the s. and s.w. are fertile plains, bounded by hills, covered with vines or timber. The climate of this rich champagne district, with its bulwark of mountains against the n. and n.e. winds, is remarkably mild and healthy. Sheep, including some flocks of the merino breed, and cattle are reared in large numbers. Fruits and tobacco are largely cultivated. Coal, copper, manganese and iron are found. Cotton spinning is carried on. The arrondissements are Gray, Lure, and Vesoul, and Vesoul is the capital.

SÃO PAULO, a southern maritime province of Brazil, bounded on the n. by the province of Minas Geraes. Area, 112,330 sq. m.; pop. '90, 1,637,354. Its coast-line—part of which in the n.e. is high and rocky, though the rest is low—is about 300 m. in length. Sugar, coffee, cotton, wine and tobacco are staple crops; horses, cattle, and swine are reared for

export; and among the minerals are the precious metals and gems. There are several commodious harbors, and the capital is São Paulo.

SÃO PAULO, a city of Brazil, capital of the province of the same name, stands on an uneven elevation between two small streams, tributaries of the Tiete, 35 m. n.w. of Santos. There are an academy of laws, a hospital, city hall, episcopal palace, many churches, and a theater. The general appearance of the town is picturesque, and the vicinity and suburbs are beautiful. Pop. '92, 100,000.

SÃO PEDRO DO RIO GRANDE. See RIO GRANDE DO SUL.

SAP, the fluid which circulates in plants, and is as indispensable to vegetable life as the blood to animal life. Entering by the roots of the plant (see ENDOSMOSE), it ascends through the cells and vessels of the stem, proceeding to the surface of the leaves and utmost extremities of the system, and having been exposed, chiefly in the leaves, to the influences of air and light, returns through the bark, a portion ultimately reaching the root and being excreted there, while another portion probably enters again into circulation with the new fluid entering from the soil. See CIRCULATION OF SAP. Sap in its most simple state, the ascending or crude sap, consists chiefly of water, mucilage, and sugar; the elaborated sap varies much more in its properties in different plants, forming the peculiar juices of the plants. The elaborated sap always contains much less water than the ascending sap. Plants seem to derive their supply of sap not only from the soil by their roots, but also from the atmosphere by the stomata (q.v.) of their bark and leaves; and some, especially succulent plants, are capable of existing and increasing in size although entirely severed from the soil. The ascending sap appears to find its way through the whole wood of the stem in ligneous plants, but chiefly through the alburnum or sap-wood. The elaborated sap has been named Latex (q.v.).—The ascent of the sap is one of the most wonderful phenomena of spring, and seems to depend not so much on the state of the weather, for it begins in the depth of winter, as on the plant having had its sufficient period of repose, and being therefore constrained by its very nature to renewed activity.

SAP, in military engineering, is a narrow ditch or trench, by which approach is made from the foremost parallel toward the glacis or covert-way of a besieged place. The sap is usually made by four sappers, the leading man of whom rolls a large gabion before him, and excavates as he progresses, filling smaller gabions with the earth dug out, and erecting them on one or both sides to form a parapet. The other sappers widen and deepen the sap, throwing more earth on to the parapet. A sap is considered to advance in average ground about eight ft. per hour. From the nearness of the enemy's works, running a sap is an extremely dangerous operation. When possible, therefore, it is carried on at night; in any case, the sappers are relieved at least every hour. When a sap is enlarged to the dimensions of a trench, it bears that name.

SAPAJÓ is the name of a group of South American monkeys including the ordinary sapajoes (*ateles*, q.v.) and other sapajoes, as the weeper or *cebus* (q.v.). See also SPIDER MONKEY. All the sapajoes are exceedingly active, but the fore hands are not as well developed as in the old-world monkeys. The thumb is longer, but more on a line with the other fingers; facial angle about 60°. They feed chiefly on fruits and insects. One of the most common species is the weeper above mentioned. Humboldt describes another species, *cebus albifrons*, about the same size as the weeper, with a grayish-blue face, and a grayish olive body. It was found in the forests near the cataracts of the Orinoco river. They are often kept as playthings by the Indians. Humboldt saw one catch a pig every morning and ride him about on the savanna while he was feeding. The horned sapajo has a singular tuft of hair on the forehead in the form of a crescent, or a waterman's cap, having the appearance of two horns when viewed in front. It is a native of French Guiana. *Cebus monachus*, the large-headed sapajo of the English, has the head covered with short whitish hairs, as if shorn. The sides of the face, breast, and belly are of a yellowish-white; fore-arms, hinder extremities, and tail black; back mottled with black and light brown. The genus *saguinus* includes the following species: *S. sciureus*, *S. personatus*, *S. legens*, *S. amictus*, *S. torquatus*, *S. matoch*, *S. melanocheir*, and *S. infulatus*. *S. sciureus* is the *simia sciureæ* of Linnæus; *callithrix sciureus* of Geoffroy; *sagoin saimiri*, *saimiré* of the French, *saimiré* of the natives of the Orinoco, and *titi* of Humboldt. It is about the size of a common gray squirrel, being about ten inches in length without the tail, which measures from a foot to fourteen inches. The body is greenish yellow above, gray on the thighs and arms, and white on the belly. Feet, legs, and fore-arms reddish chestnut; muzzle dark; the rest of the face and the ears flesh-colored; tail black at the tip, covered with hair, and not prehensile, but, when the animal is at rest, wound round the body. It is said to sleep in the sitting posture with its head hanging between its fore-legs. In both extremities the nails of the thumbs are broad, but those of the fingers are more claw-like. There is considerable variation in the classification of this group of monkeys.

SAPAN WOOD, SAPPAN WOOD, or BUKKUM WOOD, the wood of *Cæsalpinia Sappan* (see CÆSALPINIA), an East Indian tree, about 40 ft. high, with twice pinnate leaves, and racemes of yellow flowers. The wood is much used as a dye-wood, yielding a good red

color, which, however, is not easily fixed. It is a very considerable article of export from Singapore and other ports of that region both to Calcutta and to Europe.

SAP GREEN, a coloring matter obtained by adding lime to a juice extracted from the berries of the buckthorn (*Rhamnus catharticus*). The color is chiefly used as a water-color pigment, but though very pretty, is not regarded as permanent.

SAPINDA CÆ, a natural order of exogenous plants, consisting of trees and twining shrubs furnished with tendrils, and a few herbaceous climbers. Their leaves are often marked with lines or pellucid dots. The flowers are in racemes or racemose panicles, hermaphrodite or unisexual. The calyx is 4 to 5-partite, or consists of 4 to 5 sepals. The petals are 4 to 5, occasionally wanting, hypogynous, usually having an appendage in the inside. The stamens are usually 8 to 10; often inserted into the disk, which is fleshy, and sometimes glandular. The ovary is generally 3-celled, the cells containing one or few ovules. The fruit is fleshy, or *samaroid*, or capsular. The order contains about 380 known species, natives of warm climates, especially of South America and India; none of them natives of Europe, although the horse-chestnut (q.v.) is now as well known in many parts of it as most of its native trees.—The timber of some species is valuable, particularly that of *pteroxylon utile* and *hippobroma alatum*, natives of the cape of Good Hope, the former known there by the name of *nieshout*, and the latter of *pardepis*. Some are used in medicine as astringents. Narcotic and poisonous properties are very generally developed—also, a saponaceous principle, especially in the genus *sapindus* (see SOAP BERRY). Yet guarana bread (q.v.) is made from the seeds of a species of this order; the leaves of another (*cardiospermum halicacabum*) are used as a boiled vegetable in the Moluccas; and the fruits of some species are excellent.

SAPODILLA PLUM, the name given in the West Indies to the fruit of *achras sapota* and other species of *achras*, a genus of the natural order *sapotaceæ*. The seeds are aperient and diuretic, but an overdose is dangerous. The pulp of the fruit is subacid and sweet, and is much esteemed for the dessert in the West Indies. The fruit of *achras mammosa* is called MARMALADE. The NASEBERRY, also of the West Indies, belongs to this genus.

SAPONIFICATION. See OILS AND FATS; SOAP.

SAPONINE, $C_{32}H_{54}O_{18}$, is a vegetable principle contained in various plants, including the *saponaria officinalis*, or soap-wort, the *polygala senega*, several varieties of *lychnis*, the fruit of the horse-chestnut, etc. It is readily extracted from the root of soap-wort by means of boiling alcohol, which, as it cools, deposits the saponine as an amorphous sediment. It derives its name from its behavior with water, in which it is soluble in all proportions, yielding an opalescent fluid which froths when shaken, like a solution of soap, if even $\frac{1}{1000}$ part of saponine be present. Its solution, or an infusion of soap-wort, is sometimes employed in place of a solution of an alkaline soap, for cleansing the finer varieties of wool from grease.

SAPOTA CÆ, a natural order of exogenous plants, consisting of trees and shrubs, often abounding in milky juice. The leaves are leathery, entire, and without stipules. The flowers are axillary; the calyx regular, persistent, generally with five divisions; the corolla monopetalous, hypogynous, deciduous, regular, its segments usually equal in number to those of the calyx, rarely twice or thrice as many. The stamens are inserted on the corolla, fertile ones generally as many as the segments of the calyx, and generally with alternate sterile ones. There is no disk. The ovary is superior, with several cells, each cell with one ovule. The fruit is fleshy; the seeds nut-like, sometimes cohering; the *testa* bony and shining, with a very long, opaque, and softer scar on the inner face.—There are considerably more than 200 known species, chiefly natives of the tropics, and the remainder of sub-tropical countries. One of the most recently discovered species is also already one of the most important, *isonandra gutta*, which produces gutta percha (q.v.).—The fruits of some are pleasant, as the sapodilla (q.v.), and other species of the genus *achras*, the STAR APPLE (q.v.), and other species of *chrysophyllum* (see MONESIA BARK), different species of *mimusops*; *imbricaria malabarica* and *I. maxima*, various species of *lucuma*, etc. The genus *bassia* (q.v.) contains species valuable for the oils which they yield. The seeds of *mimusops elengi* also yield oil abundantly.

SAPPER, the name given to a private soldier in the corps of English engineers.—The name of the corps was formerly royal sappers and miners.

SAPPHIRE, a gem excelled in value by no precious stone except diamond, and regarded as a variety of corundum (q.v.), highly transparent and brilliant. It is sometimes colorless, and the colorless kind, called *white sapphire*, is sometimes sold as diamond. It more frequently exhibits exquisite color, generally a bright red or a beautiful blue; more rarely gray, white, or green. The red variety is the oriental ruby (q.v.) of lapidaries; the blue is that commonly called sapphire, and which has received this name from ancient times. It is found crystallized, usually in six-sided prisms, terminated by six-sided pyramids; and is sometimes found imbedded in gneiss; but it more frequently occurs in alluvial soils. It occurs at Bilin in Bohemia, and Expailly in Auvergne, but more abundantly in some parts of the east. Ceylon is famous both for its rubies and its sapphires, the latter being the more abundant. They occur with garnets and other

minerals, in a stratum of water-worn pebbles firmly imbedded in clay, in which there are occasional lumps of granite and gneiss. But nothing has yet been done to seek for them in their original situation in the mountain rocks. A piece of sapphire, which was dug out of the alluvium within a few miles of Ratnapoora in 1853, was valued at upward of \$20,000. The sapphire was one of the stones in the breastplate of the Jewish high-priest. Among the Greeks it was sacred to Jupiter.—The name *girasol sapphire* is given to a beautiful variety with a pinkish or bluish opalescence, and a peculiar play of light. The *chatoyant sapphire* has more pearly reflections. The *asteria sapphire* has in its midst a star of six rays. The chemical formula of sapphire is Al_2O_3 , with the addition of a minute quantity of chromic oxide, the amount of which determines the color. Common corundum contains other oxides which destroy the beauty of the stone. It is found in various parts of the world; in the granite of Siberia, in granular limestone in New Jersey, and in the ripidolite of North Carolina. The finest rubies are found in Burmah and Siam, and the finest blue sapphires in Ceylon. A barbel blue sapphire, a fine gem, but weighing only 6 carats, once brought, at a public sale in Paris, \$350. The ordinary price of blue sapphires is the square of the weight in carats multiplied by \$2.50. If the above had not been a rare specimen its price would have been about \$90. The ruby, or red sapphire, is, however, the most precious variety. A ruby of over 20 carats is commonly called a carbuncle, and the finest tint, the one most prized, is what is known as *pigeon's blood*. In Burmah, when a very fine stone is found, a procession of elephants carrying dignitaries and soldiers is sent to meet it, and one of the titles of the king is *lord of the rubies*. The topaz or yellow sapphire was the second stone in the breastplate of Aaron. A perfectly pure crystal of corundum, without any color, but transparent, is called a white sapphire, and is so beautiful a gem that it has been mistaken for a diamond. The emerald corundum is one of the rarest gems. Some specimens have been found in Montana. Deville and Caron formed small crystals of sapphire by the action of boracic acid on fluoride of aluminum at a white heat, adding variable quantities of fluoride of chromium to impart the various colors. Gaudin formed them by decomposing potash alum with charcoal. See Kuntz, *Gems and Precious Stones of North America* (1890).

SAPPHIRE D'EAU, or **IOLITE**, a mineral, called also *dichroite* and *Cordierite*, one of the anhydrous silicates of alumina; crystalline form, six or twelve-sided rhombic or hexagonal prisms, but often found in an amorphous condition. The color is of various shades of blue—deeper in the axial direction; yellowish-gray transversely; transparent to translucent, having much the appearance of glass. Hardness, 7 to 7.5; specific gravity, 2.6 to 2.7. The following is an analysis by Stromeyer of a specimen from Bodenmais, Bavaria: Silica, 48.35; alumina, 31.71; magnesia, 10.6; protoxide of manganese, 0.33; protoxide of iron, 8.32; water, 0.59 = 99.46. A specimen from Haddam, Conn., gave: Silica, 49.62; alumina, 28.72; magnesia, 8.64; protoxide of manganese, 1.51; protoxide of iron, 11.58; lime, 0.23 = 100.3. A specimen from Unity, Me., according to Jackson, gave: Silica, 48.15; alumina, 32.5; magnesia, 10.14; protoxide of manganese, 0.28; protoxide of iron, 7.92; water, 0.5 = 99.49. Iolite fuses slowly on the edges in the blow-pipe flame to a blue transparent glass; with borax it forms a clear bead. When in fine powder it is partially dissolved in concentrated mineral acids. It occurs at Bodenmais in perfect crystals $1\frac{1}{2}$ in. thick, and this variety has been called *pelion*, from its smoky appearance. It occurs in quartz at Ujordersloak in Greenland; in granite at cape de Gata, Spain; at Arendal in Norway; and at Tunaberg in Sweden. In Ceylon there is a transparent variety occurring in small, rolled masses of an intense blue color, which is particularly the *sapphire d'eau* of the jewelers. Iolite occurs at Haddam, Conn., associated with garnet and anthrophyllite in gneiss, and in various other parts of Connecticut and Massachusetts, and at Richmond, N. H., in talcose rock. Iolite is sometimes used as an ornamental stone, and, when cut, has a very fine play of colors, which vary, as above stated, when viewed in different directions. The word *iolite* means *violet stone*. It is called *dichroite* from its dichroism (q. v.), and *Cordierite* after the geologist, M. Cordier. Iolite becomes soon altered on exposure to air and moisture. The change may be caused by simple hydration, as in *fahlunite*, or the removal of part of the protoxide bases by carbonic acid, or by the action of water containing alkaline carbonates, forming *pinite* and mica. There are several other altered forms, as *gigantolite*, *aspasiolite*, *praseiolite*, *weissite*, *pyrrargellite*, *liebenerite*, *iberite*, and *Huronite*, the latter from Canada, near lake Huron, considered analogous to *fahlunite* by T. Sterry Hunt.

SAPPHO, along with Alcæus, the chief representative of the Æolian school of lyric poetry, was b. either at Mitylene or at Eresos in Lesbos. She was only six years old when she lost her father Scamandronymus. She was contemporary with Alcæus, Stesichorus, and Pittacus, with the first of whom she lived in friendly intercourse, as is seen in the surviving lyrics of both. All that we know of her is contained in an obscure reference in the Parian marble, and in one of the epistles of Ovid, to her having fled from Mitylene to some place of refuge in Sicily, between 604 and 592. Her famous plunge into the sea from the Leucadian rock, on finding her love for Phaon unrequited, seems to be an invention of later times. At Mitylene she is supposed to have been the center of a literary coterie, all of them females, and most of them pupils of her own in the art of poetry. Her moral character has been the subject of controversy in modern times; the most recent disputants being the late Col. Mure and the well-known F. G.

Welcker of Bonn, who, in the *Rheinisches Museum* (1857-58), appeared, the former, for the prosecution, and the latter for the defense. To whatever opinion on this subject we may incline, there is no doubt of her high lyrical genius, which was the admiration of antiquity from Solon downward, and which, as still surviving in her matchless ode to Aphrodite, enhances our regret that, of the nine books of her poems, we only possess fragments. The best text is that contained in Bergk's *Poeta Lyrici Græci* (1854); the best separate edition is Neue's (1827).

SAPPORO. The capital of that division of Japan called the Hokkaidō (circuit of the Northern sea), including Yezo, the Kurile islands, etc. The city is laid out after the general manner of an American town, and is situated on a fertile plain in the valley of the Ishikari river, 10 m. from the sea of Japan; pop. '87, 13,800. The broad streets cross each other at right angles in the direction of the cardinal points, but the buildings are mostly in Japanese style, which is unsurpassed for good taste and economy both in convenience and construction. The government buildings are in American style, the capitol being a somewhat imposing structure, surmounted by a dome-like cupola. Its lat. is 43° 3' n., long. 141° 22' e, from Greenwich. Water for factory-power, irrigation, and drinking is furnished by the Toyohira, a mountain stream which flows through the city. The Ishikari river is 11 m. from the city. The character of the vegetation is like that of Virginia. Under the superintendence of American engineers and scientific men model farms, saw-mills, steam factories, improved roads and mining machinery, canning establishments, etc., have been introduced, and railways on the American model of construction and rolling stock are now in progress with a view of bringing to shipment the produce of the immense areas of coal fields, whose possible output is said to be enormous. Distance from Hakodate, 150 miles.

SAPUCAIA NUT, the seed of *lecyrthis ollaria*, a lofty tree, which is plentiful in the forests of the n. of Brazil, and belongs to the natural order *lecyrthidaceæ*. The fruit is urn-shaped, as large as a child's head, and opens by a lid which falls off. Each fruit contains a number of seeds or nuts, as in the case of the allied Brazil nut. The flavor is finer than that of the Brazil nut, although, hitherto, the sapucaia nut is much less common in our shops. Its form is oval, somewhat pointed at both ends, which are slightly bent in opposite directions. Monkeys are very fond of the sapucaia nut, and are sometimes caught in consequence of thrusting the hand into a capsule, and not being able to withdraw it when filled with a nut, while they obstinately keep hold of the expected prize.

SA'RABANDE, originally a slow dance, said to be of Saracenic origin; and hence a short piece of music, of deliberate character, and with a peculiar rhythm, in $\frac{3}{4}$ time, the accent being placed on the second crotchet of each measure. The sarabande is of frequent occurrence among the *suites* or series of short pieces written by Handel, Sebastian Bach, and others of the old masters, for the harpsichord or clavichord.

SARACENIC ARCHITECTURE. See ARABIAN ARCHITECTURE.

SARACENS, a name variously employed by mediæval writers to designate the Moham-medans of Syria and Palestine, the Arabs generally, or the Arab-Berber races of northern Africa, who conquered Spain and Sicily and invaded France. At a later date it was employed as a synonym for all infidel nations against which crusades were preached, and was thus applied to the Seljuks of Iconium, the Turks, and even to the pagan Prussians. The true derivation of the word was long a puzzle to philologists; Du Cange deduced it from Sarah, the wife of Abraham, an opinion coincided in by the mediæval Christian authors; Hottinger (*Biblio. Orient.*), from the Arab. *saraca*, to steal; Forster (*Journey*), from *sahra*, a desert; while others strove to see its origin in the Hebrew *sarak*, poor; but the opinion which has been most generally supported, and prevails at the present time, is, that the word was originally *Sharkeyn** (Arab. "eastern people"), corrupted by the Greeks into *Sarakenoi*, from which the Romans derived their word *Saraceni*. The epithet Sarakenoi was applied by the Greek writers (from the 1st c. of the Christian era) to some tribes of Bedouin Arabs in eastern Arabia, though they do not agree among themselves as to the particular tribe so denominated. Pliny and Ammianus place the Saracens in Arabia Petræa and Mesopotamia, on the common frontier of the Roman and Persian empires; and the description of them by the latter, a most painstaking and accurate historian, coincides, in every important particular, with what is known at the present day of the Bedouin tribes of those regions.

SARACEN'S HEAD, a not unfrequent bearing in heraldry. It is represented as the head of an old man, with a savage countenance.

SARAGOSSA, or ZARAGOZA, a city of Spain, the capital of a province of the same name, and formerly of the kingdom of Aragon. It stands on the Ebro, here a muddy stream, which divides the city into two parts, and is crossed by a noble stone bridge, built in 1437. The city has an imposing appearance from a distance, being adorned with numerous slender towers and spires; but the traveler, on entering it, finds it full of

* *Sharkeyn*, or *Sharakyoun*, "eastern people," is thus opposed to *Magharibé*, or *Maghribé*. "western people," the self-styled appellation of the inhabitants of *Maghrib* ("the west") or *Morocco*.

narrow winding lanes, instead of streets, although the houses—which are built of brick—are of most solid structure, and many of them are the palaces of a nobility who have now ceased to reside here. These buildings, rich in finely carved decorations and magnificent cornices, are now mostly inhabited by agriculturists of a rude class; their spacious courts converted into farm-yards, and filled with dung-heaps. Everything about the city indicates decay and poverty. Saragossa was the Celtiberian *Salduba*, but received the new name of *Cæsarea Augusta* in 25 B.C., of which the present name is a corruption. It was a place of importance under the Romans, but there are few remains of the Roman city. Saragossa was one of the first cities of Spain in which Paganism was generally renounced and Christianity adopted; it afterward became rich in relics, to which miraculous powers were ascribed. Saragossa was taken by the Moors in the 8th c., and recovered from them in 1118, after a siege of five years, during which great part of the inhabitants died of hunger. It was taken by the French in 1809, after a siege of eight months, and one of the most heroic defenses recorded in the history of modern warfare. See PALAFOX. Saragossa has a university, founded in 1474. It has two cathedrals, both interesting as specimens of architecture; but the older is in a simple and severe style; the modern one—that of *Nuestra Señora del Pilar*—is very ornate. The latter cathedral boasts of a pillar on which the Virgin descended from heaven, 40 A.D.—an event so strongly attested, that Diego de Astorga, primate of Spain, on Aug. 17, 1720, excommunicated all who even questioned it. Pilgrims flock from all neighboring parts of Spain to this pillar and the image of the Virgin, which came down from heaven. Pop. '87, 92,407.

SARAGOSSA, MAID OF. See AGUSTINA.

SARANAC, a town in Clinton co., N. Y.; intersected by Saranac river and the New York Central and Hudson River railroad; 15 miles w. of Plattsburg. Pop. '90, 3496.

SARANAC LAKES, two connected lakes in the Adirondack wilderness in Franklin co., N. Y. The upper lake is ten m. in length, and from two to three in width; the lower lake is smaller, and about five m.e. of the upper. The Saranac river flows from this lake into lake Champlain after a course of about 100 m. Numerous other small lakes lie about these waters, and are connected with them. The surrounding country is densely wooded, and is a resort for summer sojourners and huntsmen.

SARANSK', a t. of European Russia, in the province of Penza, and 88 m. n. from Penza, at the confluence of the Saranga and Insara, feeders of the Sura. Pop. '93, 14,641.

SARASATE Y NAVASCUES, PABLO MARTIN MELITON, DE, violinist, b. in Pampeluna, Spain, March 10, 1844. He studied the violin at the Paris Conservatoire under Alard, and harmony under Reber, winning prizes in 1857 and 1859. Appearing first in Paris, he traveled throughout Europe and North and South America. He made his first visit to London in 1874, and since then has frequently appeared there. In 1889 he made a second visit to America with Eugen d'Albert, and played in New York and other cities, with great success. Sarasate possesses a wonderful degree of technique, and while his tone is neither rich nor powerful, is delicate and refined. Max Bruch wrote for him his Scotch fantasy and second concerto, and Lalo, his concertos and symphonie espagnole. Sarasate's compositions are light and Spanish in character and are for his own instrument. They include, *Zigeunerweisen*, *Spanische Tänze*, *Sérénade andalouse*, Fantasias on airs from *Don Giovanni*, *Faust*, *Carmen*, and other operas and national airs.

SARATOGA, a co. in e. New York, bounded on the e. by Hudson river, on the s. by the Mohawk; drained also by the Sacondoga river; traversed by the Champlain canal, the Adirondack, the Delaware and Hudson and other railroads; about 800 sq. m.; pop. '90, 57,663, chiefly of American birth. The surface is hilly, mountainous in the n., and heavily timbered. The soil is fertile. The principal productions are corn, rye, hay, and oats. Co. seat, Ballston Spa.

SARATOGA, BATTLE OF, was fought at a critical period of the American revolution. Gen. Burgoyne, having captured fort Ticonderoga in July, 1777, was pursuing Gen. Schuyler in his retreat from fort Edward, intending to force his way to the navigable waters of the Hudson. Gen. Gates on taking command of the American forces had forthwith moved his army back to Stillwater. Sept. 14 Burgoyne crossed the Hudson, and took position on the heights overlooking the American camp. On the 19th he advanced his right wing upon the Americans. He was promptly resisted by Gen. Arnold with Morgan's sharp-shooting riflemen. A severe encounter ensued and continued for many hours, till night compelled a cessation. The Americans retired having lost 300 men. The British lost 500 men, but held the field. Both armies rested in their fortified camps, neither being anxious for a general battle. Oct. 7, Burgoyne, having vainly waited for promised re-enforcements from the British forces near New York, renewed the contest, leading forth his best battalions with the grenadiers and artillery. His left wing was opposed by the Americans under Gen. Poor; Arnold also, with impetuous daring, led his men into a hand-to-hand combat. The batteries were repeatedly taken and retaken, till the British, by their own captured artillery, were driven from the field. Gen. Morgan was equally victorious over Burgoyne's right wing, whose valiant leader, Gen. Fraser, was mortally wounded. The whole British army became demoralized.

and Burgoyne began a retreat. The exultant Americans closely followed, drove out the Hessians, and took a portion of his camp. Gen. Arnold was severely wounded leading this last charge. Night again closed the contest, and before morning Burgoyne had retreated, and was soon entrenched in his first fortified camp. Here, however, he could not remain. The Americans had captured his supplies, and closed every avenue for retreat. Not daring to risk another battle, and despairing of the expected succor, short of provisions and hourly expecting an attack from the Americans, flushed with their recent success, he proposed an armistice to arrange the terms of capitulation. Gen. Gates demanded unconditional surrender. This Burgoyne refused, and terms more favorable to the British were concluded Oct. 15. Burgoyne surrendered nearly 6000 prisoners of war, forty pieces of brass artillery, several thousand stand of small arms, and great stores of ammunition. The report of this battle encouraged the people and quieted fears of other incursions from Canada.

SARATOGA SPRINGS, a town and village in Saratoga co., N. Y.; on the Adirondack, the Delaware and Hudson, the Fitchburg, and the Saratoga and Mount McGregor railroads; 38 miles n. of Albany. The village is the most celebrated inland watering-place in America, and, possibly, in the world. The mineral springs, for which the place is noted, are found in a narrow ravine extending several miles nearly north and south, and were known to the Indians for centuries. Saratoga is supposed to be the designation for "place of the swift water," and the first white man benefited by the use of these medicinal waters was Sir William Johnson, who was brought here by the Indians in 1767, although Jacques Cartier heard of them in 1535. Major Peter Schuyler defeated the French, under De Monteth, near the site of the present town, in 1693. The first log-cabin was built in 1773, and the first frame-house by Gen. Philip Schuyler in 1784; and as the fame of the waters spread, hotels and boarding-houses rapidly increased early in the present century. "The Union," on the spot where the Grand Union now stands, was the first hotel erected, in 1803. There are about thirty hotels, large and small, and many boarding-houses, besides medical institutions. The Grand Union and the United States are among the largest, if not the very largest, hotels in the world, and magnificently appointed. Others of note are the Congress, Clarendon, Windsor, Kensington, and with the boarding-houses, from 30,000 to 40,000 guests are accommodated every summer. There are about forty springs in active use, the principal of which are the Congress, High Rock (the first known), Hathorn, Putnam, Excelsior, Hamilton, Geyser (spouting spring), Star, Empire, Columbian, Washington, and Red Spring. Some are chalybeate, others contain iodine or sulphur, and all are lively with carbonic-acid gas, making them pleasant to drink. They are tonic and cathartic, and are efficacious for chronic dyspepsia, skin and liver diseases, rheumatism, etc. The bottled waters are exported in large quantities. The streets are beautifully shaded, and there are Congress, Yaddo, and Woodlawn parks; a boulevard, 100 feet wide, leads to Saratoga Lake and a race-course. There are banks and newspapers, schools, a young ladies' seminary, and young men's institute. The cottage where Gen. Grant died is on Mt. McGregor, eleven miles distant. The wealth and fashion of the United States congregate at Saratoga every summer. There are a large convention hall, town hall, and armory, children's home, emergency hospital, Home of the Good Shepherd, several libraries, national banks, and daily, weekly, and monthly periodicals. Pop. '90, town, 13,171; village, 11,975.

SARATOV, a government in the s.e. of Russia, is bounded on the e. by the river Volga, and on the n. by the governments of Penza and Simbirk. Area, 32,624 sq. m.; pop. '95, 2,345,394. Its dimensions were much larger prior to 1850, when a considerable portion of it—the portion to the east of the Volga—was taken to form a part of the government of Samara (q. v.), erected in that year. Nearly half the area of S. is as yet waste-land, while large portions are heavily wooded. The chief rivers are the Volga and the Medwieditza. Considerable agriculture is carried on, and manufactures are growing.

SARATOV, a city of Russia, capital of the government of the same name, on the right bank of the Volga, 532 m. s.e. of Moscow. Though its houses are generally built of timber, the town has a rich and picturesque appearance. Its 16 churches are ornamented with numerous towers and cupolas; and its broad streets, from the character of the houses and of the elegant equipages that roll through them, have quite a European appearance. It has flour-mills, distilleries, oil works, and tobacco factories. Pop. '97, 133,116.

SARAWAK, a territory on the n.w. coast of Borneo, is bounded s. and w. by Sambas, e. by Brunai, and n. by the bight of Datu. The coast stretches from the w. of cape Datu, in lat. 2° n. and long. 109° 55' e., to the e. of the river Samerahan, in long. 111° 3' e., a distance of nearly 70 miles. Area, 50,000 sq. m. Pop. 300,000. The Sarawak is an important river; it has two navigable mouths, the one entering the bight of Datu in lat. 1° 42' 30" n., and long. 110° 20' 30" e.; the other a few miles further to the east. Other considerable rivers are the Rejang (navigable for 120 m. for vessels of more than 1000 tons), the Lündu, Samerahan, and Sadang. A chain of mountains, 3000 ft. in height, rises in Sarawak, and, with increasing elevation, tends toward the n.; while others are detached, as the Samerahans, and the steep, densely-wooded Lündu. Sandstone and granite are the prevailing rocks; porphyries, basalt, and quartzose schists also occurring. In some parts the soil is clayey; in others it is a rich mold. With the exception of some cultivated spots, the surface is covered with forests, which abound with wild swine,

harts, and a variety of monkeys. There is excellent coal near the river Sadang. Antimony ore, which can be both easily worked and shipped, is obtainable in any quantity; copper and gold have been found, and iron ore is plentiful at Lündu. Fine timber trees, as iron-wood, ebony, sandal-wood, teak, and other sorts peculiarly adapted for shipbuilding, grow on the lands near the mouths of the rivers. Overtopping them all is the tall camphor tree (*dryobalanops aromatica*), from which, by incision, the valuable camphor-oil is obtained; or by felling and splitting the wood, the crystallized camphor, which is prized above that produced in any other part of Asia.

The climate is not considered unhealthy. Much rain falls from September to March, and the thermometer usually indicates about 83° F. Edible nests, wax, and aromatic woods are collected by the Dyaks for the Singapore market, and the plains are well adapted for the growth of rice and sago. In 1862 two cargoes of choice timber for shipbuilding were sent to the royal dockyards of Great Britain, and more attention is now being paid to that natural source of wealth. The chief articles of export are gutta percha, sago flour, antimony ore, and edible birds' nests, and the imports are, in the main, European manufactures and tobacco. In 1895 the imports amounted to \$3,089,393, and the exports to \$3,141,932. The exportation of antimony and sale of opium are monopolized by the government, and, with a small head-tax, form the chief revenue. In 1895 the revenue was \$453,800, and the expenditure \$462,382.

The original inhabitants are Dyaks, divided into some 20 tribes, and speaking different dialects; they are, for savages, mild, industrious, and honest. Malays live on the coast, and the mines are worked by Chinese. From 1841 to 1868 Sarawak was governed by Sir James Brooke (q.v.), as an independent rajah appointed by the sultan of Borneo, in return for distinguished services in putting down rebellion and restoring order; and even on the testimony of the Dutch, who view with extreme jealousy the increased influence of the British on that coast, his rule did much to promote the civilization and prosperity of his people. Sir James was succeeded by his son.

The seat of government is the town of Sarawak, or Kuching, near the mouth of the river, which is navigable for large ships. Mission-stations and schools have been erected, and the population has increased to 25,000. In 1888 the neighboring territories were placed under British protection, while in 1890 Sarawak annexed the district of Limbang.

SARCEY, FRANCISQUE, French writer, was born at Dourdau, Oct. 8, 1828. He entered the Normal School in 1848 with Taine and Edmond About. For seven years he taught in several small towns, and in 1858, coming to Paris, began to write for the *Figaro*. The next year he became dramatic critic of the *Opinion Nationale*, and in 1867 transferred his services to the *Temps*, to which he has ever since contributed the weekly review of the theatres, being recognized as the first dramatic critic of Paris. When About started the *Dix-Neuvième Siècle*, Sarcey was the chief editorial contributor. He has little taste for party politics, but is energetic in righting abuses and in discussion of public works, his reputation in France being that of working journalist as well as critic. His writing is distinguished by strong common sense, enlivened by sharp and alert wit. He has published: *History of the Siege of Paris* (1870); *Le Nouveau Seigneur du Village* (1862); *Le Mot et la Chose* (1862); *Le Piano de Jeanne* (1876); *Comédiens et Comédiennes* (1878); and a new series, 1878-1884; *Les Misères d'un fonctionnaire chinois* (1882); *Souvenirs de jeunesse* (1885); *Souvenirs d'Âge mûr* (1892), and *Le Théâtre* (1893). In 1889 he was on the point of presenting himself as a candidate for the Academy, but upon reflection renounced the intention, declaring himself satisfied with his reputation as journalist.

SARCINA (Lat. a package), or **SARCINULA**, a genus of minute plants of very low organization, sometimes reckoned among *algæ*, and sometimes among *fungi*. A number of forms or species are known. The first discovered, called *S. ventriculi*, was originally observed by Goodsir in matters vomited from the human stomach. It is of a roundish quadrangular form, about $\frac{1}{16}$ to $\frac{1}{32}$ of a line in diameter; the individuals generally grouped in cubes of 4, 16, or 64 in the cube, separated by rectangular striæ. Although the most common seat of sarcinæ is the human stomach, they have likewise been detected in the stomach of the tortoise, the rabbit, the dog, the ape, and in the cæcum of the fowl; in the urine, in a considerable number of cases; in the lungs; in the fæces and intestinal canal; in the fluid of the ventricles of the brain; in cholera stools; in the fluid of hydrocele; in the bones; and Dr. Lowe has noticed its existence in stagnant water. It appears from the measurements of Welcher that the sarcinæ occurring in urine are about half the size of those occurring in the stomach, and the aggregations of sarcina cells are also smaller.

The occurrence of the sarcina in the urine, the fluid of the ventricles of the brain, etc., is probably a *post-mortem* phenomenon of little diagnostic or pathological importance. Its appearance in vomited fluids is, however, characteristic of a peculiar and important form of dyspepsia. The vomited matter in these cases has a faint acid smell, like that of fermenting wort, and is obviously in a state of fermentation. After standing a few hours it becomes covered with a thick, brownish, yeast-like froth, and deposits a brown flaky sediment. On examining the froth and the deposit under the microscope sarcinæ are found in great abundance, together with the torulæ characteristic of yeast (q.v.). The fluid is always acid, if sarcinæ are present. The amount of vomited matter is always large, and sometimes enormous. It is usually ejected in the morning, after a

night spent awake from a sense of heat, gurgling, and distention in the epigastric region; and its discharge gives almost immediate relief. Dr. Budd, one of the highest authorities in diseases of the stomach, believes that the disease consists, primarily and essentially, in some organic change, which prevents that organ from completely emptying itself, and which causes a secretion from its coats, capable, when mixed with food, of undergoing or exciting a process of fermentation; and that the development of the sarcinæ bears to this process, or to some stage of it, the same relation which the development of torulæ bears to simple alcoholic fermentation. The well-known power of sulphurous acid in checking the fermentative process induced Prof. Jenner to try the effect of sulphite of soda—a salt which readily yields its sulphurous acid—in this disease; and experience has fully confirmed the accuracy of Jenner's induction; for this salt, administered soon after a meal, or when the fermenting process is commencing, in doses varying from 10 grains to a dram, dissolved in water, is the most effectual remedy at present known for relieving this disorder. The hyposulphite of soda, in somewhat larger doses, has a similar action.

SARCOLEM'MA is the term applied to the delicate sheath which invests each primary muscular fibre. See **MUSCLE**.

SARCOMA. The large group of tumors now classed together under the name of sarcomata or sarcomas includes many which were until recently known by a variety of other names and grouped in other divisions, and the term sarcoma, which now has a definite meaning, was formerly applied to many soft growths. Many hard sarcomas have been classed as scirrhus or hard cancer, but several tumors formerly known as fibro-plastic, fibro-muscular, fibro-nuclear, malignant fibroid, and mycoid, have been placed among the sarcomas. See **TUMORS**.

SARCOPH'AGI. See **CANNIBAL**.

SARCOPH'AGUS (Gr. flesh-eater), any stone receptacle for a dead body. The name originated in the property assigned to a species of stone found at Assos in Troas, and used in early times, of consuming the whole body, with the exception of the teeth, within the space of 40 days. The oldest known sarcophagi are those of Egypt, some of which are contemporary with the pyramids. The earliest of these are of a square or oblong form, and either plain or ornamented with lotus leaves; the latter are of the form of swathed mummies and bear inscriptions. The Phœnician and Persian kings were also buried in sarcophagi. The Roman sarcophagi of the earlier republican period were plain. Sarcophagi were occasionally used in the later republic.

SARDANAPA'LUS. See **ASSYRIA**.

SARDE, or **SARDA**, a variety of quartz, differing from carnelian only in its very deep red color, blood-red by transmitted light. It is rare, and brings a much higher price than common carnelian. The name is probably from Sardis. The sarde was one of the stones of the breastplate of the Jewish high-priest. There were also two in the ephod. The **SARDONYX** is an onyx (q. v.) containing layers of sarde.

SARDÉS, or **SARDIS**, anciently a city of Asia Minor, the capital of Lydia, was situated in a fertile plain between the northern base of mount Tmolus and the river Hermus, about 60 m. e.n.e. of Smyrna. Through its *agora*, or market-place, flowed the Pactolus, a tributary of the Hermus. The city is first mentioned by Æschylus. It was taken by the Cimmerians in the reign of king Ardys (680–631 B.C.). In the reign of Cræsus, the last Lydian king, Sardés attained its highest prosperity. It became the residence of the Persian satraps after the overthrow of the Lydian monarchy. The Athenians burned it 503 B.C., and it afterward passed under the Romans, and was the seat of a separate provincial government. It is one of the seven churches mentioned in the book of Revelation.—*Sart*, the modern Sardis, is a poor village, worthy of mention only for the ruins of the ancient city to be seen in the vicinity.

SARDINE, *Clupea sardina*, a fish of the same genus with the herring and pilchard, smaller than the pilchard; abundant in the Mediterranean, and found also in the Atlantic ocean, although not so far n. as the British shores. It is much esteemed for its flavor, and sardines preserved in oil are exported in large quantities from some of the Mediterranean ports. But the "sardines" of the west coast of France, which are largely imported into Britain, are generally not true sardines, but young sprats—the *garvies* of the firth of Forth—and sometimes young herring.

Sardines appear in shoals on the coasts of the Mediterranean at particular seasons, as herrings and pilchards on those of Britain. The sardine fishery on the coast of Provence is chiefly in the months of May, June, and July; but the fishery for sprats, which are cured as sardines, and sold under that name on the coast of Bretagne and elsewhere in the west of France, takes place in the winter months. The quantity of both kinds cured is so great as to amount in value to 3,000,000 or 4,000,000 francs annually, about £120,000 to £160,000. They are exported to the most distant parts of the world, cured with oil in tin boxes, forming a much esteemed delicacy, and at the same time a most wholesome article of food. To cure them in this way they are first carefully washed in the sea, then sprinkled with fine salt, and after a few hours the head, gills, etc., are removed; they are then washed again, and spread out on willow branches or wire-work exposed to the sun and wind if the weather is dry, but in damp and rainy weather to a current of air under cover. They are next put into boiling oil,

in which they remain for a short time, and when they are taken out the oil is drained away from them as much as possible, and they are put into the tin boxes of which the shape and appearance are so familiar to every one. The boxes being filled with sardines are filled up with oil, the lid is soldered on, and they are placed for a short time in boiling water or exposed to hot steam. The boxes which have leaked or have burst in boiling are rejected, and those which remain sound are now ready for the market.

In the south of France sardines are sometimes cured in red wine, and those so cured are called *sardines anchoisées*, or anchovied sardines.

For many years establishments in Maine have existed for the purpose of preserving menhaden in oil after the manner above described. The result is a delicacy hardly to be distinguished from French sardines. The companies are thriving; and thus, tons of hitherto waste food are utilized.

Several species of small *clupeidæ* much resembling the sardine are found in different parts of the world, and are used in the same way as the sardine of the Mediterranean. One species frequents the southern and eastern coast of Ceylon in such vast shoals that 400,000 have been taken at a single haul of the nets in a little bay; and when the shoal approached the shore the broken water became as smooth as if a sheet of ice had been floating below the surface.

SARDINIA, ISLAND or, the largest, after Sicily, of the islands of the Mediterranean, lies directly s. of Corsica, from which it is separated by the strait of Bonifacio, a channel only 7 m. wide in its narrowest part. Sardinia is situated about half-way between central Italy and Africa, and between southern Italy and Spain. Its length is 166 m.; greatest breadth, 90 m.; and area, 9294 sq. miles. The country is mostly mountainous, some of the peaks of the central chain having an elevation of 6,300 feet. The Limbara range, in the n.w., is granite, the diagonal chain palæozoic, and the central range of the tertiary calcareous formation; many of the peaks, especially within the semicircle formed by the Limbara range, are extinct volcanoes. The coasts are generally steep and rugged. A few islands lie off the coast, and all, of any considerable size and importance, are situated at the corners; off the n.e. corner are the Maddalena group, consisting of Maddalena, Caprera, and five or six minute islets; off the n.w. corner is Asinara; and off the s.w. corner are San Pietro and San Antioco. The island is well supplied with streams, but none of them have a long course, and only one is partially navigable.

Soil and Climate.—Between the mountain ranges are several wide valleys of remarkable beauty and fertility. There are also several large sandy or stony districts (*macchie*), of almost irremediable sterility. The mountain sides are partly rocky and barren, partly clad with woods, and partly fitted for pasture. The climate is mild, the temperature ranging from 34° to 90°; but in the low lands, which are largely of a marshy character, and in the neighborhood of the littoral lakes, a deadly malaria (*intemperie*) prevails, especially in autumn. The inhabitants of those districts, who can afford to do so, migrate annually during the unhealthy season; and those who are compelled to remain never leave their houses till an hour after sunrise, and carefully return before sunset, taking all precautions to prevent the entrance of the poisonous gas by door or window. The inhaling of the miasma by a stranger is considered among the inhabitants to be as deadly as a dose of strong poison.

Products.—Wheat, barley, maize, oranges, and other fruits are produced in abundance, and are esteemed for their excellent quality. The vine is extensively cultivated, but from carelessness in the process, the wine is not so good as might naturally be expected. The olive-grounds are extensive, and the produce excellent. Tobacco (of inferior quality), cotton, linseed, flax, hemp, saffron, and madder are also produced. The woods which clothe the mountain sides are chiefly composed of cork, chestnut, oak, pine, and other timber trees, which form a considerable item in the export trade. Many mountain-slopes have, however, been much deteriorated in fertility by the excessive cutting down of timber. The manufacture of tobacco and salt is a government monopoly.

The bullock is the favorite animal for draught, but horses are also used; and a small species of pony, which in ancient times was much esteemed by the Roman matrons, is still found. The sheep are of ordinary quality, and the swine are said to be among the best in Europe. Few cows are kept, and cheese is obtained almost wholly from sheep's and goat's milk. Wild boars and deer are not uncommon, and the moufflon is found in the Alpine woods. Foxes, rabbits, hares, and martens are so abundant that a large export trade in their skins is carried on. The fisheries are important.

Manufactures are insignificant, being mostly the result of home industry; but the royal manufactories of gunpowder, salt, and tobacco are of considerable importance. Sardinia is rich in minerals, but these, like its other resources, are as yet little developed; silver, mercury, granite, gypsum, marble, alabaster, amethyst, and other precious stones are found; and lead, iron, zinc, manganese, coal, and copper are in considerable abundance. Gold, bismuth, and antimony are said to exist.

Inhabitants.—The inhabitants bear a considerable resemblance to the Greeks, and speak a barbarous dialect, composed chiefly of Spanish, Arabic, and Italian; they are ignorant and bigoted, having been subjected to misgovernment and oppression from their emancipation from Roman rule till 1836, when feudal tenure was abolished, and the enormous power of the clergy somewhat reduced. They are generally stupid and indolent, clothe themselves in sheep-skins, and invariably profess the Catholic religion.

The custom of the *Vendetta* is frequently practiced, though not to the same extent as in Corsica.

History.—Sardinia, at first called by the Greeks *Ichnusa* and *Sandaliotis* (from its resemblance to a human foot-print), and afterward *Sardo* by the Romans, was colonized at a very early period. The first really historical event is its conquest, about 480 B.C., by the Carthaginians, who, during their occupation, rendered the island a celebrated corn-producing country. They were forced to abandon it to the Romans (238 B.C.), who gradually subdued the rebellious natives, and made it a province of the republic; but on three several occasions formidable outbreaks required the presence of a consul with a large army to restore the authority of Rome. From this time it was held as a subject province, and on account of its value as the "granary of Rome," was carefully protected from invasion. It fell into the hands of the Vandals and other barbarians, and was recovered by the eastern empire in 534 A.D., but was finally separated from the Roman empire by the Saracens. They were driven out in their turn by the Pisans, one of whose deputy-governors, being supported by the Genoese, obtained the erection of Sardinia into a kingdom (1154) by Frederick I. The popes, who had long claimed a right of suzerainty over the island, gave it, in 1296, to James II. of Aragon; and it continued in the possession of Spain till 1708, when it was taken possession of by the British, and by the peace of Utrecht (1713) it was yielded to Austria. In 1730 Austria gave it to the duke of Savoy in exchange for Sicily, and it has since that time formed a part of the dominions of the house of Savoy. When Sardinia came to the house of Savoy, two-thirds of it belonged to barons of Spanish descent, and the most of the remainder to the clergy, who also levied a tithe on the whole produce, and for a century afterward it was shamefully neglected by the government. However, in 1836 and 1837, patrimonial rights and compulsory labor were abolished; and in 1838 and 1847 the peasants were freed from the rest of the vexatious imposts with which they were burdened. In 1847 the vice-royalty was abolished, and Sardinia incorporated with the Sardinian kingdom (q.v.). It is at present divided into two provinces or *capos*—Cagliari in the s., containing 5257 English sq.m., with a pop. of (1889) 449,414; and Sassari in the n.; containing 4142 English sq.m., with a pop. of (1889) 286,174. Cagliari is the capital. Pop. of island, '93, 741,362.

SARDINIA, KINGDOM or, a former kingdom of Italy, and the nucleus of the present *Kingdom of Italy*, included the duchies of Savoy and Genoa, and parts of those of Montferrat and Milan, the principality of Piedmont, the county of Nice, and the islands of Sardinia and Caprera, amounting in all to 19,564 English sq.m. of continental territory, with a pop. of (1857) 4,590,260, and 9,205 of insular territory, with a pop. of 577,282; total area, 28,769 English sq.m., pop. 5,167,542. In 1859 it was increased by the addition of the Austrian portion of the Milanese, and diminished by the cession in 1860 of Savoy and Nice to France, the change in the continental territory being shown by the following figures: area, 21,099 English sq.m. pop., 6,530,232; the insular territory remaining unaltered. The various districts above mentioned differ greatly from each other in physical configuration and climate, and the more important of these are treated in separate articles. See also ITALY. The Roman Catholic religion was established by law in Mar., 1848; but monastic orders, with the exception of those which are also benevolent institutions, were suppressed May 28, 1855. In 1859 the army amounted to 76,172 men, and the fleet to 29 ships (none of them men-of-war), with 436 guns; the revenue (1858), which was mostly derived from customs, duties, and direct taxation, to \$28,995,000; and the expenditure to \$29,745,000—a want of equilibrium in the finances which had long existed, and which caused the establishment, since 1819, of a gradually increasing national debt, that amounted (1858) to \$135,000,000.

The kingdom of Sardinia was originated by a treaty (Aug. 24, 1720) between Austria and the duke of Savoy (q.v.), by which the latter agreed to surrender Sicily to the former on condition of receiving in exchange the island of Sardinia, and the erection of his states into a kingdom. In 1730 *Victor-Amadeus I.*, the last duke of Savoy and first king of Sardinia, resigned the throne to his son, *Charles-Emmanuel I.* (1730-73); but repenting his resolution, and attempting to resume the government, he was put in prison, where he died in 1732. His son, by joining with France and Spain against Austria, obtained (1735) the territories of Tortona and Novara, to which were further added (1743), during the war of the Austrian succession, the county of Anghiera and the territories of Vigevano and Pavia. He was the author of the code known as the *Corpus Carolinum*. His successor, *Victor-Amadeus II.* (1773-96), acceded to the European coalition against France, and was deprived in consequence of Savoy and Nice in 1792; but sustained by England and the pope, he raised an army, and maintained himself in his kingdom till 1796, when Bonaparte forced him formally to relinquish the territories he had lost. His son, *Charles-Emmanuel II.* (1796-1802), was at first an ally of France; but the directory, in 1798, compelled him to surrender all his continental possessions, which were then incorporated with France; and it was not till the first peace of Paris (May 30, 1814) that the house of Savoy regained its territories. The congress of Vienna (Dec., 1814) annexed to Sardinia the ancient republic of Genoa, and the second peace of Paris (1815) restored a small portion of Savoy, which France still possessed, and gave

the king a protectorate over the small principality of Monaco. Long before this time Charles-Emmanuel had abdicated, and his brother, *Victor-Emmanuel I.* (1802-21), succeeded to his rights, and made his entry into Turin, May 20, 1814. His return restored the ancient misgovernment; and similar political changes in the other Italian states revived the societies of the "Carbonari" (q.v.) and other similar secret associations, whose aims were supported by a portion of the nobility and army, and by the heir-presumptive to the throne, Charles-Albert, prince of Savoy-Carignan. The insurrection of the army on Mar. 9-10, 1821, brought on a general revolution. But the king having abdicated in favor of his brother, *Charles-Felix* (1821-31), and the Austrians having come to the rescue, the insurrection was put down. Under the protection of an Austrian army of occupation till 1823, Charles-Felix re-established absolute power, recalled the Jesuits, persecuted the Protestants, and took various other measures for rooting out all opposition. On his death the elder line of Savoy became extinct, and the succession fell to the cadet branch of Savoy-Carignan (see SAVOY, HOUSE OF), whose rights had been recognized by the congress of Vienna, and *Charles-Albert* (q.v.) (1831-49) ascended the throne. The liberals were gratified with some slight reforms, but the power of the clergy was untouched, and the conspiracy of Nov. 30, 1833, at Turin, and the mad inroad of Mazzini, at the head of a small band of German, Polish, and Italian refugees, in Feb., 1834, only disturbed the country, and confirmed the government in its despotic policy. The interior administration was, however, carried on with more energy than under the two previous reigns, through the conclusion of treaties with France, Britain, Turkey, the Low Countries, Denmark, Austria, and the Hanse towns, etc.; the construction of roads, bridges, and railways was vigorously prosecuted, and agriculture and other industries were encouraged. In 1842 the king commenced a gradual but progressive liberal policy, promulgated a limited act of amnesty to political offenders, relaxed the severity of censorship, reformed judicial administration and prison discipline, and abolished the feudal system in Sardinia. The kingdom participated in the agitations of 1846 and 1847, which affected the whole peninsula, but was wholly exempt from insurrections and conspiracies, the people contenting themselves with expressing their views and wishes in petitions and demonstrations displaying entire confidence in the government. On Feb. 8, 1848, the king announced a new and extremely liberal constitution, which was proclaimed some weeks afterward; a liberal law of election was decreed, the first Sardinian parliament convoked for April 17, and the act of amnesty declared general. In the midst of these changes the revolution broke out, and Charles-Albert, who was saluted with the title of "the sword of Italy," put himself at the head of the movement, and declared war against Austria. (See ITALY, RADETSKY, etc.) On the day after the fatal rout of Novara (Mar. 13, 1849), Charles-Albert abdicated, and was succeeded by his son, Victor-Emmanuel (q.v.), who, in alliance with France, declared war against Austria in 1859; and by Mar., 1861, was in possession of the whole of Italy, except Venetia and Rome, and exchanged the title king of Sardinia for that of king of Italy. Venetia was added to the kingdom in 1866, and the papal states in 1870, when the union of Italy was complete. See ITALY.

SARDONIC SMILE is a term applied by the older medical writers to a convulsive affection of the muscles of the face, somewhat resembling laughter. It may occur in tetanus or lock-jaw, and other convulsive affections, or may result from the action of certain vegetable poisons, such as the *ranunculus sceleratus*, or celery-leaved crowfoot. The name is derived from a species of *ranunculus* that grows in Sardinia.

SARDOU, VICTORIEN, b. Paris, 1831; studied medicine, and wrote many articles for newspapers and reviews. In 1854 his first comedy, *La Taverne des Etudiants*, was a complete failure. He fell into extreme poverty, and in 1857 was nursed through a dangerous fever by Mlle. de Brécourt, the lady who afterward became his wife, and by whom he was introduced to Mlle. Déjazet, proprietor of the *Théâtre Déjazet*. For this theater he wrote pieces, of which *Monsieur Garat* and *Les Près-Saint-Gervais* were most successful. He at once rose in fame and fortune, and has since produced a very large number of comedies and *vaudevilles*; and one tragedy, *La Haine*, 1874. Among the most popular of his works are *Nos Intimes*, 1861; *La Perle Noire*, 1862; *Les Pommes du Voisin*, 1864; *Le Roi Carotte*, 1872; *Dora*, 1877; *L'Oncle Sam*, 1873, a satire on American society; *Theodora* (1884); *La Tosca* (1887); *Cleopâtre* (1890); *Thermidor* (1891); and *Marcelle* (1896). Sardou was elected to the French Academy, 1877, has acquired a large estate, and has the decoration of the legion of honor.

SARGAS'SUM—SARGAS'SO SEA. See GULF-WEED.

SARGENT, a co. in s. eastern N. Dakota; 864 sq. m.; pop. '90, 5076. Co. seat, Forman.

SARGENT, EPES, 1813-1880; b. Mass.; educated at Boston Latin school, and spent two or three years at Harvard college. On leaving college he devoted himself to literature in New York and Boston, and was connected with the editorial staffs of many periodicals. He was a frequent contributor to the *Knickerbocker Magazine*, and to the early volumes of the *Atlantic Monthly*. He assisted S. G. Goodrich in preparing his geography and some of his Peter Parley books. He wrote, in 1836, *The Bride of Genoa*, a play produced with success at the Tremont theater, Boston. In 1837 he wrote for Miss Ellen Tree the tragedy *Velasco*, which was produced with success in Boston, New York, and Washington, and in 1850 in England. He wrote two other plays, a comedy, *Change Makes Change*, and a tragedy, *The Priestess*; also the lives of several of the

English poets prefixed to editions of their works. Some of his songs obtained popular currency, and a series of school reading-books, edited by him, was very popular. His *Cyclopædia of Poetry* appeared posthumously in 1881.

SARGENT, HENRY, 1770-1845; b. Gloucester, Mass.; son of Daniel, and brother of Lucius Manlius; educated at Dummer academy, went to London and entered the studio of sir Benjamin West. Returning to this country he became adj.gen. of the state of Massachusetts, and aid to Gov. Brooks and Gov. Strong. He was a member of the academy of arts and sciences, and inventor of an elevated railway. One of the best productions of his brush, "The Landing of the Pilgrims," valued at \$3,000, was presented by him to the Pilgrim society of Plymouth, and is still preserved in Pilgrim hall; other interesting works are "The Dinner Party" and "Christ's Entrance into Jerusalem."

SARGENT, JOHN OSBORNE, b. Mass., 1810; graduated at the Boston Latin school, and at Harvard college in 1830; practiced law in Boston; was a member of the legislature 1835-36; connected with the Boston *Atlas* 1835-36; associate editor of the New York *Courier and Inquirer* 1837-41; practiced law in New York 1838-48; took charge of the *Battery*, a whig campaign paper at Washington; founded in 1849, with A. C. Bullitt, the *Republic*. He has translated several books from the German, published some legal and political pamphlets, and a lecture on *Improvements in Naval Warfare*, with a biographical sketch of John Ericsson; assisted S. G. Goodrich in several of the Peter Parley books and some of his school histories. D. 1891.

SARGENT, JOHN SINGER, artist, was born in Florence in 1856, his father being an American physician. He studied under Carolus Duran, and has spent most of his time abroad; was made member of the legion of honor (1889), associate of the Royal academy 1894, and academicien 1897. His work is largely portraits. He has resided in London since 1885. Among his portraits are those of Carolus Duran (1879) and Carmencita, the latter in the possession of the French government.

SARGENT, LUCIUS MANLIUS, 1786-1867; b. Boston; studied law, but did not practice. He had considerable influence as a writer and lecturer upon temperance. He was the author of *Temperance Tales*, which passed through more than 100 editions; *Life of Samuel Dexter*, 1858; and *Dealings with the Dead, by a Sexton of the Old School*, 1856.

SARGENT, NATHAN, 1794-1875; b. Putney, Vt.; studied law and commenced practice at Cahawba, Alabama, and was appointed county and probate judge 1816. He removed to Buffalo, N. Y., and resided there 1826-30. In the latter year he began the publication, in Philadelphia, of a newspaper in the interest of the whig party, and subsequently wrote letters from Washington to the *United States Gazette*, over the signature of *Oliver Oldschool*. He was at one time president of the Washington reform school, and was sergeant-at-arms of the U. S. house of representatives 1849-51. He was register of the treasury 1851-53, commissioner of customs 1861-71. He wrote *Public Men and Events*, 2 vols., 1875.

SARGENT, PAUL DUDLEY, 1745-1828; b. Gloucester, Mass.; son of Col. Epes. He was col. in the patriot army during the revolution, commanding a regiment when Boston was besieged by the British. He fought in the battle of Bunker Hill; was wounded; promoted to brig.gen. 1776. He participated in the engagements at Harlem, Trenton, Princeton, and White Plains; and was appointed judge of the court of common pleas, Hancock, Maine, soon after the war, holding the office many years.

SARGENT, WINTHROP, 1753-1820; b. Mass.; joined the American army in 1775, and became navy agent at Gloucester in 1776. He served through the war in the artillery, attaining the rank of maj. In 1786 he was appointed surveyor of the North-west territory, in 1787 its secretary, and 1798-1801 was its governor. He was adj.gen. of St. Clair's forces in the expedition against the Indians in 1791, and of Wayne's forces in the campaign of 1794-95. He wrote *Boston, a Poem*, 1803.

SARGENT, WINTHROP, 1825-70; b. Philadelphia; graduated at the university of Pennsylvania and the Harvard law school. He settled in New York, where he practiced law. Among his works are *Loyalist Poetry of the Revolution*, 1857-60; *History of an Expedition Against Fort Duquesne*; and *a Life of André*, 1861.

SARI', the capital of the province of Mazanderan, Persia, is situated on the banks of a small stream, the Tejend, 18 m. s. of the Caspian sea. It is a modern town, built near the ruins of a very ancient one, and contains a pop. of about 8,000.

SARK, one of the Channel islands. See JERSEY—THE CHANNEL ISLANDS.

SARMA'TIANS. The root *s-rm* in this word is in all probability the same as *s-rb*, so that it has been conjectured the name Sarmatians has the same ethnological meaning as *Serbi* and *Servi*. The oldest Greek form of the word (and the only one found in Herodotus) is *Sauromata*. The region occupied by the Sarmatians embraced (according to Ptolemy, our chief authority) a portion both of Europe and Asia.—1. The *European Sarmatians* are found as far w. as the Vistula; as far n. as the Venedicus Sinus (gulf of Riga?), or even further; as far e. as the Crimea and the Don; and as far s. as Dacia. Roughly speaking, their territory corresponded to modern Esthonia, Lithuania, western Russia, and parts of Poland and Galicia. The principal, or at least the best-known

nations among the European Sarmatians, were the Peucini and Bastarnæ, about the mouths of the Danube, and in Moldavia and Bessarabia; the Jazyges and Roxolani, probably in Kherson, Tauris, and Ekaterinoslav; the Venedi and Gythones, about Riga, Memel, and Elbing; and the Avareni, at the sources of the Vistula.—2. The *Asiatic Sarmatians* are found as far w. as the Tanais (Don), as far e. as the Caspian, as far s. as the Euxine and Caucasus, and as far n. as the water-shed between the rivers that fall into the White sea and the Black, but we have no distinct knowledge of their territorial possessions. North of the Don, in the region now occupied by the Don Cossacks, dwelt the *Perierbidi*; s.e. of it, about Astrakhan, the Jaxamatæ. Beyond the Perierbidi lay the Asæi, the “horse-eating” (*Hippophagi*) Sarmatæ, the “Royal” and Hyperborean Sarmatæ, and many others, besides a multitude of nations in the region of the northern Caucasus. The question naturally arises: What were these Sarmatians? The vast extent of territory over which they spread, and the manifest inclusion under the name Sarmatians of different races, as, for example, Goths, Finns, Lithuanians, Circassians, Scythians, and Slaves, prove that the term was loosely used by Ptolemy and his contemporaries, just like the older Herodotean term Scythia, and is not strictly ethnological; yet Dr. Latham’s view (see Smith’s *Dictionary of Greek and Roman Geography*, arts. Sarmatia and Scythia), that it designated on the whole Slavic races, and in particular the north-eastern portion of the great Slavic family, may be regarded as tolerably certain. The Sarmatians figure prominently among the barbarians who vexed the north-eastern frontiers of the Roman empire.

SARMIENTO, DOMINGO FAUSTINO, b. Buenos Ayres, 1811; a teacher at San Luis in 1826; opposed Rosas and was exiled to Chili in 1831; returned and established a school for girls at San Juan in 1836; edited a literary paper; went to Chili in 1840, where he interested himself in education. In 1845 he was sent by the Chilian government to visit the educational institutions of Europe and the United States. In 1851 he returned to the Argentine republic, became col. in the army, minister of the interior, governor of the province of San Juan, and minister of public instruction; was minister plenipotentiary to the United States 1864–68, when he was chosen president of the Argentine republic. The country was very prosperous under his administration, commerce being encouraged, railways and telegraphs constructed, schools established, and a national observatory founded. His important works are: *Manual de la Historia de los Pueblos Antiguos*; *Arji Ropólis ó la Capital de los Estados Confederados*; *Viajes por Europa, Africa y América*; *Vida de Abrah. Lincoln*. D. 1888.

SARNIA, town and co. seat of Lambton co., Ontario, Canada; on the St. Clair river and the Grand Trunk railroad; opposite Port Huron, Mich., with which it is connected by a steam ferry and a railroad tunnel. It is the last port of entry at which Canadian vessels bound to the upper lakes can call. The former Port Sarnia, now Point Edward, is a suburb in the n. part of the town. Sarnia has several churches, branch banks, and daily and weekly newspapers. Its trade is important, and its commerce both by rail and steamer is increasing in consequence. It has manufactures of ale and beer, lumber, iron castings, machinery, wooden-ware, woollens, leather, etc. Pop. '91, 6,692.

SARNO, a town of southern Italy, in the province of Salerno, on the river of the same name, 12 m. n. of Salerno. It is a well-built town, with a very handsome cathedral containing some good paintings, and has a seminary for priests, a hospital, several paper manufactories and foundries. Its environs are famous for the produce of very fine silk. Silk, cotton, linen, and hempen fabrics are manufactured. Among the buildings worthy of notice is the ancient castle of the Barberini family. Pop. '81, 14,464.

In the plain near Sarno, Teias, king of the Goths, in a desperate battle with the Greeks, commanded by Narses, in 553, was vanquished and slain, and the reign of the Goths in Italy brought to a close.

SAROS, a co. in n. Hungary, drained by the Topla, Tarcza, and other rivers; intersected in the n. by the Carpathian mountains; about 1400 sq. m.; pop. '90, 168,021, mostly Slovaks and Germans. The surface is uneven, and broken by ridges of the Carpathians. The soil along the river valleys is fertile, the climate is salubrious. The principal productions are grain, flax, hemp, oats, and fruit. There are salt and iron mines. Opals and other precious stones are found. Capital, Eperies.

SARPA, a river in Russia, tributary to the Volga in the district of Astrakhan. It flows northwards for a distance of about 100 miles.

SARPI, PIETRO, better known by his monastic appellation, FRA PAOLO, or brother Paul, was b. at Venice in the year 1552; became an early proficient in mathematics as well as in general literature, resolved to embrace the monastic life, and in his 20th year took the vows in the religious order of the Servites. Soon afterward he was appointed by the duke of Mantua to a professorship of theology in that city; but he held it only for a short time; and returning to his order, of which he was elected provincial in his 27th year, he continued to pursue in private his studies in languages, in mathematics, in astronomy, and in all the other branches of natural philosophy, including the medical and physiological sciences, in which he attained to great proficiency, being by some writers regarded (although, as it would seem, without sufficient grounds) as entitled to at least a share in the glory of the discovery of the circulation of the blood. The freedom of some of his opinions led to his being charged at Rome with heterodox views, and although

held free from actual heresy, his opinions became an object of suspicion; and in the dispute between the republic of Venice and Paul V. (q.v.) on the subject of clerical immunities, Sarpi justified these suspicions by the energy with which he threw himself into the anti-papal party. On being summoned to Rome to account for his conduct, he refused to obey, and was accordingly excommunicated as being contumacious. The zeal of Sarpi's opposition to Rome drew upon him the hostility of the partisans of the Roman claim; and an attempt was even made upon his life by a band of assassins, whom the ardor of party-spirit at the time did not hesitate, although upon mere presumption, to represent as emissaries of the Jesuits. Fra Paolo himself openly professed to share this suspicion, and believing his life in danger, confined himself thenceforward within the inclosure of his monastery. It was in this retirement that he composed his celebrated *History of the Council of Trent*, which has long been the subject of controversy and criticism. It was published in London by Antonio de Dominis, the ex-bishop of Spalatro, who had recently conformed to Protestantism, at first under the pseudonym of *Pietro Soave Polano*, an anagram of the real name of the author, *Paolo Sarpi Veneto*; and it almost immediately rose into popularity with the adversaries of Rome as well in England as throughout the continent. It is by no means a simple history of the proceedings of the council, but rather a controversial narrative of the discussions, in which the writer freely enters into the merits of the doctrines under discussion, and in many cases displays a strong anti-Catholic bias. His judgment of the motives and of the conduct of the members of the council, especially of the representatives of the pope and his partisans in the assembly, is uniformly hostile, and has been accepted by Protestants as a strong testimony against Rome from a member of the Roman church. It must be confessed, however, that whatever judgment we may form of Sarpi's credibility on his own merits, it is idle to look upon him in the light of a member of the church of Rome. It is plain, from numberless declarations in his work, and from remains of his correspondence published after his death, that his opinions were strongly biased, not merely with an anti-Roman, but even with rationalistic leanings; and Ranke does not hesitate to declare that his unsupported statements cannot be accepted with security, when there is question of a damaging narrative of some intrigue of the legates in the council, or some cabal of the Italian bishops in the interest of Roman views. A voluminous counter-history of the council of Trent was written by the Roman Jesuit (afterward cardinal) Pallavicino, which follows him into the details as well of the history as of the controversy. It would be out of place here to enter into any comparison of these rival histories of the council. The history of Sarpi has been translated into most of the European languages. The French translation is by the celebrated Courayer, and is enriched with copious vindictory and critical annotations. Sarpi lived in the full vigor of intellect to the age of 71, and died of a neglected cold, which led to a protracted illness, in the year 1623. His life as an ecclesiastic was without reproach; and his long-trying zeal in the cause of the republic had made him the idol of his fellow-citizens. He was honored accordingly by the republic with a public funeral. His *History of the Council of Trent* has been reprinted in numberless editions; and his collected works were published at Verona in 8 vols. 4to, 1761-68, and again in Naples, in 24 vols. 8vo, in 1790.

SARPY, a co. in e. Nebraska, separated from Iowa by the Missouri river, bounded on the s. by the Platte; drained by the Papillon and Elkhorn rivers; traversed by the Union Pacific railroad; about 230 sq.m.; pop. '90, 6875, chiefly of American birth. The surface is rolling prairie or woodland. The soil is extremely fertile. The principal productions are corn, wheat, and oats. Co. seat, Papillion.

SARRACENIA, or SIDE-SADDLE FLOWER, a genus of very singular marsh plants, natives of North America. *S. purpurea* is common from Hudson's bay to Carolina; the other species are confined to the southern states. They are herbaceous perennial plants, with radical leaves and scapes, which bear one or more large flowers. The leaves are of very remarkable structure, the stalk being hollow and urn-shaped, and the blade of the leaf articulated at its apex, and fitting like a lid. It is from the form of the leaves that the name side-saddle flower is derived.—The genus is the type of the small natural order *sarraceniaceæ*, the only other genus of which has been discovered in Guyana. The order is closely allied to *papaveraceæ*.

SARREGUEMINES (Ger. SAARGEMÜND), formerly a frontier t. in the n. of France, but since the war of 1870-71 in the possession of Germany, is in the province of Alsace-Lorraine, 40 m. e. of Metz. It is famous for its pottery; hempen fabrics, silks, and velvets are also made. Pop. '95, 13,919.

SARSAPARILLA, or SARSA. This much-used medicine is the produce of several species of *smilax* (see SMILACEÆ), although the species yielding the different kinds brought to market have not yet been fully ascertained. Among them, the three principal are believed to be *S. officinalis*, *S. medica* and *S. papyracea*; twining shrubs, with prickly angular stems; the first with large ovate-oblong, acute, heart-shaped, leathery leaves; the second with shortly acuminate smooth leaves; the lower ones heart-shaped, the upper ones approaching to ovate; the third with membranous, oval-oblong, obtuse leaves. These shrubs are natives of warm parts of America; *S. officinalis* and *S. papyracea* being found in South America, and *S. medica* on the Mexican Andes. Some botanists regard them as mere varieties of one species.

The part of the plant used in medicine is the dried root, of which the following are the characters, as given in the British Pharmacopœia: "Roots not thicker than a goose-quill, generally many feet in length, reddish-brown, covered with rootlets, and folded in bundles about eighteen inches long, scentless; taste mucilaginous, feebly bitterish, faintly acrid." Sarsaparilla has been analyzed by various chemists, and appears to consist of volatile oil, most of which is expelled during the process of drying, of a white crystallizable neutral substance named *smilacin*, whose composition is represented by the formula $C_{16}H_{15}O_6$, an acrid bitter resin, lignin, starch, and mucilage. Sarsaparilla is one of the class of medicines called diaphoretics. The British Pharmacopœia contains three preparations of this drug—viz., the decoction, the compound decoction (containing sarsaparilla, sassafras chips, guaiac wood-turnings, liquorice root, and meze-reon), and the liquid extract. The cases in which they are serviceable are those of chronic rheumatism, secondary syphilitic affections, chronic skin diseases, etc. To be of any service, sarsaparilla must be taken in considerable doses. The compound decoction, formerly known as the *decoction of sweet woods*, is the best preparation, and should be taken in doses of four or six ounces three times a day.

The root of *S. aspera*, a native of the s. of Europe, is used as a substitute for sarsaparilla, although of inferior quality, and is called Italian sarsaparilla.

The root of *hemidesmus indicus*, a climbing shrub of the natural order *asclepiaceæ*, is used in India as a substitute for sarsaparilla, and is therefore called Indian sarsaparilla. The plant is common in all parts of India. The root has a peculiar aromatic odor and bitter taste. In consequence of the high price charged for genuine sarsaparilla, the root of *hemidesmus Indicus* or *Indian sarsaparilla* has been introduced into the British Pharmacopœia. The following are its characters: "Yellowish brown, cylindrical, tortuous, furrowed, and with annular cracks, having a fragrant odor and a very agreeable flavor. The only official preparation is the syrup; but in India, where this root is highly esteemed as a diaphoretic and tonic, and is extensively used as a substitute for sarsaparilla, an infusion prepared by infusing two ounces of the root in a pint of boiling water, is generally employed, the dose being from two to four ounces three times a day. The syrup is chiefly used, in consequence of its pleasant flavor, as a vehicle for more active medicines.

In Germany, the roots of *Carex arenaria*, *C. disticha*, and *C. hirta* (see CAREX), are occasionally used as a substitute for sarsaparilla, under the name of German sarsaparilla.

SARSFIELD, PATRICK, Earl of Lucan, 1645-93; b. Ireland; entered the army and served under Monmouth, but was in the victorious army when the latter was defeated at Sedgewick. He was a Roman Catholic and at the revolution was a member of parliament. He supported king James's effort to retain the crown, and fought at the battle of Boyne. William III. was forced by him to raise the siege of Limerick in 1690. In 1691 he commanded the reserve at Aughrim, and after a gallant defense of Limerick obtained fair terms of surrender and entered the French service. Here he distinguished himself at the battles of Steenkirke (1692), and Neerwinden (1693). He was killed in the last-named battle.

SARTAIN', JOHN, b. London, 1808; became an engraver, and in 1830 emigrated to Philadelphia. He is noted chiefly as having introduced here the art of mezzotint engraving, and as the designer of the Washington and Lafayette monument in Philadelphia. He was proprietor and editor of two magazines, and author of *Poetical and Prose Illustrations of Celebrated American Painters*, 1852. In 1896 he engraved on steel *The Iron Worker and King Solomon* after the painting by C. Shussler. He died 1897.

SARTAIN, WILLIAM, b. Philadelphia, 1843; son of John, the artist. He studied at the Penn. acad. of Fine Arts, and in Paris under Léon Bonnat, and at the *Académie Nationale des Beaux-Arts*. He became a member of the soc. of American Painters, 1877, and has contributed several pictures to its exhibitions, and has exhibited in Paris. Among his paintings are "Italian Girl," "Young Italy," "A Court-Yard, Paris," "A Street in Algiers," and an "Italian Head."

SARTHE, an inland dep. of France, n. of the Loire. Area, 2396 sq. m.; pop. '96, 425,077. It is a country of plains traversed by low hills and by undulations. Agriculture is the leading industry, and some mining and manufactures are carried on. Capital, Le Mans.

SARTI, GIUSEPPE, one of the most skillful and learned musical composers of the 18th c., was born at Faenza in the Papal States in 1729. He studied under padre Martini at Bologna; and in 1752 produced his first opera, *Il Re Pastore*, which was performed at Faenza with great success. He held for a time the office of *hof kapellmeister* at Copenhagen, but returned to Italy in 1765. In 1770, and the following years, he composed his principal operas, including *Le Gelosie Villane Giulio Sabino*, the latter of which was enthusiastically received throughout Italy, and is highly praised by Dr. Burney. In 1779 he became *maestro di capella* of the Duomo at Milan, and gave himself to the composition of church music. In 1784 he went to St. Petersburg as music director to the court of the empress Catherine, by whom he was treated with great liberality, and raised to the highest rank of nobility. He died at Berlin in 1802, on his way to Italy. His operas are thirty in number; but the composition by which he is now most known is his beautiful sacred tertzett, *Amplius Lava Me*. Sarti was the musical instructor of Cherubini (q.v.).

SARTO, ANDREA DEL, one of the most famous painters of the Florentine school, was b. at Florence in 1487. According to later writers the family name was Vannucchi, and

Andrea only received the name of *del Sarto* (the Tailor) from the occupation of his father; but this statement is probably erroneous. Sarto was a pupil of Piero di Cosimo, but formed his style mainly through study of the works of Masaccio, Domenico Ghirlandajo, and Buonarroti. These artists inspired him with a love of fresco-painting, in which he achieved great distinction. During 1509-1514 he executed a series of representations from the life of St. Filippo Benizzi, in the porch of the Annunziata at Florence; and in these the characteristics of his genius—dignity of composition, purity of form, freshness of color, and grace of expression—are seen at their best. In 1514 he commenced a series of frescoes from the life of John the Baptist, which were not finished, however, till 12 years afterward. The finest works, of what may be called his middle period, are the "Madonna di San Francesco," and the "Contending Theologians," both in the Florentine galleries. In 1518 Francis I. invited Sarto to Paris, where he painted, among other things, the picture of "Charity" in the Louvre; but at the solicitations of his wife, he returned to Florence, where he died in 1531. To the later years of his life, which were neither happy nor honorable, belong his "Piety," his most celebrated fresco the "Madonna del Sacco" (in the Annunziata at Florence), the "Madonna with Saints" (in the Berlin museum), and the "Sacrifice of Abraham" (in the Dresden gallery). His largest fresco is the "Lord's Supper," in what was formerly the abbey of San Salvi, near Florence.—See Reumont's *Andrea del Sarto* (Leip. 1835).

SARTOR RESARTUS (Latin, "the Tailor Retailored"). The title of a work written by Thomas Carlyle (q.v.), 1833-34, which, under the guise of reviewing a German work on dress, attacks the covering of falsehood and unreality which often veils the true ideas of human life.

SA'RUM, OLD, an extinct city and borough of England, was situated on a hill 2 m. to the n. of Salisbury, in Wiltshire. It dated from the time of the Romans, by whom it was known as *Sorbidunum*, and remained an important town under the Saxons. A Witenagemôte was held at Old Sarum in 960; and here William the Conqueror assembled all the barons of his kingdom in 1086. It was the seat of a bishop from the reign of William the Conqueror till 1220, when the cathedral was removed to New Sarum, now Salisbury (q.v.), and was followed by most of the inhabitants. In Henry VII.'s time it was almost wholly deserted, and has so continued till the present time. Some traces of walls and ramparts, and of its cathedral and castle, are still seen. Though without a single house or inhabitant, two members represented it in parliament, till, like many other rotten boroughs, it was disfranchised by the reform bill of 1832. William Pitt, earl of Chatham, first sat in parliament for Old Sarum in 1735. Sarum is now a parish of England with a small population.

SARVÂSTIVÂDAS, or SARVÂSTIVÂDINS (lit., those who maintain the reality of all existence), is the name of one of the four divisions of the *Vaibhâshika* system of Buddhism. its reputed founder was *Râhula*, the son of the Buddha S'akkyamuni.—See C. F. Koeppen, *Die Religion des Buddha* (Berlin, 1857); and W. Wassiljew, *Der Buddhismus, seine Dogmen, Geschichte und Literatur* (St. Petersburg, 1860).

SARZANA, a city of northern Italy, in the province of Genoa, 8 m. e. of Spezia. Its cathedral, built in 1200, is very rich in paintings and marbles. There is also an ancient fortress built by the Pisans in 1262. It is the birthplace of pope Nicholas V. Pop. '81, 4016.

Sarzana is a very ancient city, founded 176 B.C. The adjacent city of Luni having been sacked and destroyed by the Vandals and by the Normans, its inhabitants abandoned it, and took refuge in Sarzana, to which place they removed the episcopal see in 1204. There are still remains of the amphitheater at Luni.

SASH. The frames in which the glass of windows is inserted are called *window-sashes*. Common windows are usually made with an upper and lower sash, contrived so that, by means of cords or chains, pulleys, and balance-weights, they slide up and down in a wooden case.

SASIN. See ANTELOPE.

SA'SINE. (See INFEMENT.) The ceremony was as follows. the attorney of the party giving the right produced his warrant of title, and gave it to the bailie or representative of the other party, who gave it to the notary to be explained by the latter to witnesses, and then the first party delivered earth and ground, that is, part of the very soil, to the other in presence of the witnesses. The notary then drew up an instrument reciting what had been thus done, and which was signed by the notary and two witnesses. In England, *seisin* never had so narrow and technical a meaning as it had in Scotland.

SASKATCH'EWAN, a large and important river in the Northwest Territories, Dominion of Canada, draws its waters from the Rocky mountains, and is formed by two headwaters called the south branch or Bow river, and the north branch. The south branch issues from a lake about 4 m. long, fed by a glacier descending from a magnificent *mer de glace*, and by a group of springs in the vicinity. A few yards n. of this group of springs is another group, from which the north branch takes its rise. The height above the sea is 6347 ft.; the lat., 51° 40' n.; the long., 117° 30' west. The south branch flows s.e. to its junction with the Belly river in long. 111° 40' w., then

n.e. to its junction with the north branch in long. 105° west. Fed mainly from the same glacier that feeds the south branch, the north branch flows n. past Mt. Murchison, 15,789 ft. above sea-level, and one of the highest peaks of the Rocky mountains, n. through Kutanie plain, a fine prairie abounding in game, and then flows in a general eastern direction to its confluence with the south branch. From long. 105° w., the river flows e., and falls into lake Winnipeg. The total direct length of the river is estimated at 1200 miles. From its mouth it is navigable (on the north branch) about two-thirds of its entire length. It flows through a country rich in coal and iron, with a healthy climate, and comprising almost boundless plains suited to the cultivation of grain. At the sources of the Saskatchewan, there are several easily practicable routes across the Rocky mountains, especially the Vermilion pass.—S. is the name of a dist. of Canada, defined, 1882; 114,000 sq.m., lying north of Assiniboia and Manitoba, watered by the Saskatchewan, and having Battleford (q.v.), for its chief town. See CANADA.

SASSAFRAS, *Sassafras*, a genus of trees or shrubs of the natural order *lauraceæ*, having diocious flowers, a 6-parted membranous perianth, 9 stamens, a succulent fruit placed on the thick fleshy apex of the fruit-stalk, and surrounded by the unchanged perianth. The sassafras tree (*S. officinale*) of North America, found from Canada to Florida, a mere bush in the n., but a tree of 50 ft. in the s., has deciduous leaves, yellow flowers which appear before the leaves, and small dark-blue fruit. The wood is soft, light, coarse in fiber, dirty-white and reddish-brown, with a strong but agreeable smell, resembling that of fennel, and an aromatic, rather pungent and sweetish taste. The wood of the root possesses these properties in a higher degree than that of the stem, and the thick spongy bark of the root most of all. The wood is brought to market in the form of chips, but the bark of the root is preferred for medicinal use, is a powerful stimulant, sudorific, and diuretic, and is employed in cutaneous diseases, gout, rheumatism, and syphilis, generally in combination with other medicines. It contains a volatile oil, *oil of sassafras*, which is often used instead. An agreeable beverage is made in North America by infusion of sassafras bark or sassafras wood; and a similar beverage was once very commonly sold at daybreak in the streets of London under the name of *saloop*. A few saloop-venders are still to be seen plying their vocation. The leaves of sassafras contain so much mucilage that they are used for thickening soup.—Another species of sassafras (*S. parthenocylon*), possessing similar properties, is found in Sumatra.

SASSAFRAS NUTS. See PITCHURIM BEANS.

SASSANIDÆ, the dynasty which succeeded that of the Arsacidæ on the throne of Persia (q.v.), derived its name from Sassan, the grandfather of the newly elected monarch ARDISHIR. The reign of the Sassanidæ is remarkable in the history of Persia, not for the extent of their sway, or the luxury and magnificence of their court, though in these respects they could vie with the Achæmenidæ at the epoch of their greatest power and splendor, but for the intense energy which they succeeded in infusing into the people at large. A comparatively small army of Greeks might and did successfully strive against the immense hordes of a Xerxes and a Darius; but the veterans of Rome could gain no permanent laurels in a conflict with an equal force of Persians under the Sassanidæ. Ardishir made the desert of Khiva and the Tigris his boundaries, and resigned the throne to his son, SHAHPUR I. (SAPOR) (240–273 A.D.), who subdued Armenia, took Algezira (258) and Nisibis, totally routed the Romans at Edessa, taking prisoner the emperor Valerian and the relics of his army, and overrunning Syria, Cappadocia, and other portions of western Asia. This monarch paid as much attention to the prosperity of his subjects and the encouragement of the fine arts as he did to the extension of his power; but his enlightened plans were not carried out by his immediate successors.—NARSÍ (NARES) (294–303) retook Armenia, and signally defeated the Romans under Galerius; but fortune deserted him in the following year (297).—His grandson, SHAHPUR II. (310–381), surnamed POSTHUMUS, an infant, succeeded, and Persia, during his minority, was much harassed by the Arabs, Romans, and Tartars; but Shahpur had no sooner taken in his hands the reins of government than in return he ravaged Yemen, punished the Tartars, and took the sole revenge at that time in his power against the Romans, by commencing a dreadful persecution of the Christians in his dominions. A regular war speedily followed; the army of Constantius was routed at Singarah, and he was compelled to sue for peace. But the war continued; Constantius's successor, Julian, was defeated, and lost his life (363) near Ctesiphon, and the Romans were glad to conclude the humiliating peace of Dura. Armenia, Iberia, and the other Caucasian principalities were then reduced by Shahpur. The wholesome error thus infused into the Romans effectually restrained them from aggressions for many years.—Among his successors were BAHARAM V. (420–448), surnamed GOUR, who recommenced hostilities with the Romans, the result being a partition of Armenia and a truce for 100 years; and KOBAD (COBADES or CABADES) (488–498, 502–531), a wise and able monarch, who, on the Romans refusing any longer to pay the stipulated tribute, declared war against them, and defeated them in every engagement, concluding peace (505) on receiving 11,000 lbs. of gold. A second war, which commenced in 521, was from beginning to end in favor of the Persians, though the Romans at that time possessed a staff of generals unsurpassed at any previous epoch of their history. The war continued for some time after the accession of KHOSRU I. (q.v.) (531–579), and was continued at intervals till nearly the conclusion of the century, when another great Persian

conqueror, KHOSRU II. (q.v.) (591-628), ascended the throne; but the details of his annihilation of the Roman power in Asia, and the resistless march of Heraclius (q.v.), who again cooped up the Persians within the Tigris, and inflicted upon the Sassanidæ a blow from which they never recovered, will be found under these names.—After four years of petty civil war, which wore out the remaining strength of the nation, YESDIGERD III. (632-651) was raised to the throne. The Arabs, who had already twice attacked Persia without success, made a third attempt in 639, and routed Yesdigerd's army at Kudseah (Cadesia) with immense loss. Yesdigerd made another energetic attempt to rescue his kingdom; but the great battle of Nahavend, in which more than 100,000 Persians are said to have been slain, extinguished all hope of success; and the unfortunate monarch became a fugitive and a wanderer in northern Khorassan till 651, when he was treacherously murdered.—Thus perished the dynasty which had pulled down the Romans from their proud pre-eminence among nations by the hands of a horde of robber fanatics, under whose barbarous rule the extensive commercial prosperity and refined civilization which had been so carefully fostered for four centuries, were utterly swept away, leaving only such traces as ruined aqueducts, choked-up canals, and the still magnificent remains of almost forgotten cities.

SAS'SARI, a province of Italy, in n. Sardinia, bounded e., n., and w. by the Mediterranean, and on the s. by Cagliari; drained by the Posada, Tirso, Coghinias, and other rivers; about 3922 sq. m.; pop. '95 (est.) 288,359. The surface is mountainous. Capital, Sassari.

SASSARI, a city in the n.w. of the island of Sardinia, the capital of the province of the same name, 8 m. from the shore of the gulf of Asinara. It is a handsome and important archiepiscopal city, and has a vast cathedral, with many sculptures, one of which is by Canova; a university, founded in 1776; a college; and a rich library, with the MSS. of the Azuni. Sassari is a very busy town, and trades especially in grain, wine, fruits, wood, olive oil, and tobacco. Its harbor, Torres, is 10 m. n.w. of Sassari; it is narrow and shallow, and does not admit large vessels. Pop. '95, commune, 41,600.

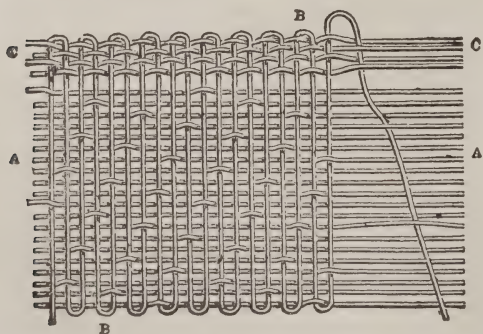
SASSULITCH, VERA, b. Russia, 1853; when about 18 years of age she fell under the displeasure of the government, and was subjected to surveillance by the police and to frequent imprisonment. Exasperated by this treatment, she, in 1878, went to the office of M. Trepoff, prefect of police, and shot him, but not fatally. At her trial she avowed her act and motives; the jury acquitted her unhesitatingly. She was re-arrested, but escaped to Switzerland.

SATA'LIAH, another name of Adalia (q.v.).

SATAN. See DEVIL.

SAT'ELLITES (Lat. *satelles*, an attendant) are certain celestial bodies which attend upon and revolve round some of the planets, as these latter revolve round the sun; and hence scientific men frequently apply to them the generic term, "secondary planets." The earth, Mars, Jupiter, Saturn, Uranus, and Neptune each possesses one or more of these attendants. The eclipses, inequalities, inclinations, and reciprocal attractions of the satellites have been carefully noted from time to time, and the theory of their motions, at least of the most prominent of them, has been found to coincide with that of the moon. The satellites of Jupiter are invested with additional interest, from their eclipses having been the means of directing Römer to his great discovery of the successive propagation and velocity of light. On careful investigation, he found that the eclipses regularly happened 16' 26" earlier when the planet was in opposition (i.e., nearest the earth), than when it was in conjunction (i.e., furthest from the earth), a phenomenon which could only be accounted for by the supposition that light requires 16' 26" to pass over a distance equal to the diameter of the earth's orbit.

SATIN, a fabric in which so much of the weft is brought uppermost in the weaving as to give a more lustrous and unbroken surface to the cloth than is seen when the warp



fabrics, woven as described; but there are woolen, linen, and cotton satins known in the markets.

SATIN-BIRD. See BOWER-BIRD.

SATINET, an inferior satin, woven much thinner than the ordinary kind. The term is also occasionally applied to a variety of cloth woven with cotton warp and woollen weft.

SATIN-WOOD, a beautiful ornamental wood obtained from both the West and East Indies. The former is the better kind, and is supposed to be the produce of a moderate-sized tree, *jerolia Guianensis*, and probably other species, as there are several varieties of the wood. That from the East Indies is less white in color, and is produced by *chloroxylon sweitenia*. Both are much used by cabinet-makers, and for marquetry, etc. The logs are usually only 6 or 7 in. square.

Chloroxylon sweitenia is a tree of the natural order *cedrelaceæ*, growing on the mountains of the Circars in India, and in Ceylon. Sir James E. Tennent says that "in point of size and durability, it is by far the first of the timber-trees of Ceylon. The richly-colored and feathery logs are used for cabinet-work, and the more ordinary for building purposes, every house in the eastern province being floored and timbered with satin-wood."—Tennent's *Ceylon*.

SATIRE (Lat. *sâtira*; older form, *sâtûra*), the name given by the Romans to a species of poetry of which they may be considered the inventors. The word *satura* (from the root *sat*, enough) is strictly and originally an adjective, meaning "full" or "filled;" but afterward it came to possess also a substantive signification, and denoted a dish filled with a medley of ingredients, like the *pot-pourri* (q.v.) of the French, or the *olla podrida* (q.v.) of the Spaniards. Hence, in its figurative application to a branch of literature, it throws a light on the primary character of that literature. The oldest Roman satire was a medley of scenic or dramatic improvisations expressed in varying meters (Livy, lib. 7, cap. 2), like the Fescennine verses (q.v.); but the sharp banter and rude jocularity of these unwritten effusions bore little resemblance, either in form or spirit, to the earnest and acrimonious criticism that formed the essential characteristic of the later satire. The earliest—so far as we know—who wrote *saturæ*, were Ennius (q.v.) and Pacuvius; but the metrical miscellanies of these authors were little more than serious and prosaic descriptions, or didactic homilies and dialogues. Lucilius (b. 148, d. 103 B.C.) is universally admitted to be the first who handled men and manners in that peculiar style which has ever since been recognized as the satirical; and the particular glory of Lucilius, in a literary point of view, consists in this, that he was the creator of a special kind of poetry, which in all subsequent ages has been the terror and aversion of fools and knaves. The serious and even saturnine gravity of the Roman mind must have readily disposed it to a censorious view of public and private vices. After the death of Lucilius, satire, as well as other forms of literature, languished, nor do we meet with any satirist of note till the age of Horace (see HORATIUS), whose writings are as a glass in which are mirrored the tastes and habits of the Augustan age. His satire, though sharp at times, is in the main humorous and playful. It is different when we come to Juvenal (see JUVENALIS)—a century later, when satire became a *sæva indignatio*, a savage onslaught on the tremendous vices of the capital. Persius (q.v.), who lived in the generation before Juvenal, is every way inferior, in force of genius, to the latter. After Juvenal we have no professed satirist, but several writers, prose and poetic, in whom the satiric element is found, of whom Martial, the epigrammatist, is perhaps the most notable.

During the middle ages the satirical element showed itself abundantly in the general literature of France, Italy, Germany, England, and Scotland. Men who have a claim to the character of satirists, *par excellence*, are Ulrich von Hutten, one of the authors of the *Epistolæ Obscurorum Virorum* (q.v.), Erasmus (q.v.), Rabelais (q.v.), sir David Lindsay (q.v.), George Buchanan (q.v.). In all of these writers, priests are the special objects of attack; their vices, their greed, their folly, their ignorance, are lashed with a fierce rage. But it was in France that satire as a formal literary imitation of antiquity first appeared in modern times. Vauquelin (q.v.) may be considered the true founder of modern French satire. The satirical verses of Mottin, of Sigogne, and of Berthelot, of Mathurin Regnier, *L'Espadon Satirique* of Fourqueraux, and *Le Parnasse Satirique* attributed to Théophile Viaud, are very impure in expression, and remind us that at this time a satire was understood to be an obscene work—the 17th c. scholars supposing that the name had something to do with Satyr, and that the style ought to be conformed to what might be thought appropriate to the lascivious deities of ancient Greece! During the 17th and 18th centuries, both England and France produced professed satirists of the first order of merit, who have not been surpassed by the best either of their predecessors or successors. The names of Dryden (q.v.), Butler (q.v.), Pope (q.v.), and Churchill (q.v.) on this side of the channel, of Boileau (q.v.) and Voltaire (q.v.) on the other, are too well known to require more than mention. Dr. Edward Young (q.v.) and Dr. Johnson (q.v.) have also made a name for themselves in this branch of literature. It may be noticed, however, as a distinguishing characteristic of Dryden, Boileau, Young, Pope, Churchill, and Johnson, and as a mark of the difference of the times in which they lived from those of the satirists of the reformation, that it is no longer the church that is assailed, but society, political opponents, literary rivals, etc.; the war is carried on, not so much against bad morals in the clergy as against the common vices of men in general, or is

even the expression of partisan hatreds. Swift (q.v.) and Arbuthnot (q.v.) are perhaps as great satirists as any of those we have mentioned.

Satire in the shape of political squibs, lampoons, etc., is very abundant in the 17th and 18th centuries. Butler's *Hudibras* is simply one long lampoon against the Puritans; most of the playwrights of the restoration were royalist satirists—unscrupulous and indecent partisans. Dryden himself was but *facile princeps* of the herd. Andrew Marvell (q.v.) is the most famous name on the side of liberty. The *Beggars' Opera* of the poet Gay is a piece of very fine political satire. Gifford (q.v.) and Wolcot (q.v.), better known as Peter Pindar, also deserve mention in a historical point of view, though their intrinsic merits are small. Incomparably superior to all their contemporaries, and among the first order of satirists, are Robert Burns (q.v.) and Cowper (q.v.).—Meanwhile, in France, since Voltaire, no great name has appeared, except, perhaps, that of Béranger (q.v.), though the spirit of satire has pervaded most of the current literature, more particularly political literature, of which one of the latest expressions is the pamphlet published in 1865 by M. Rogeard against the system of government pursued by Napoleon III., and entitled *Les Propos de Labienus*. In Germany the most conspicuous modern names are those of Hagedorn, Rabener, Sturz, Stolberg (q.v.), Kästner, Wieland (q.v.), Tieck (q.v.), and Goethe (q.v.), but none of these have adhered very strictly to the classic models of satire. Of 19th c. satirists in England, the best are Byron (q.v.), James and Horace Smith (q.v.), and Hood (q.v.) in poetry; and Hook (q.v.), Jerrold (q.v.), Thackeray (q.v.), and Carlyle (q.v.), in prose. To these may be added the name of the author of the *Bigelow Papers*, James Russell Lowell.—See Sellar's *Roman Poets of the Republic* (3d ed. 1890); Browne's *History of Roman Classical Literature* (Lond. 1853); Thomson's *History of Roman Literature* (forming a volume of the *Encyclopædia Metropolitana*); Nettleship's *Roman Satura*.

SATOLLI, FRANCESCO, Archbishop of Lepanto and papal delegate to the United States, was born at Perugia, Italy, in 1841. His studies were pursued at the Diocesan Seminary of his native town, then presided over by Archbishop Gioacchino Pecci, afterward Pope Leo XIII. He early showed marked ability, so that Archbishop Pecci, when he became Pope, appointed the young priest to a professorship in the Roman Seminary and School of the Propaganda. Later, when new questions came to the Church in the United States, Mgr. Satolli was sent out as Papal Ablegate with plenary power (Nov., 1892), which was confirmed by his appointment in January, 1893, as Apostolic Delegate to the American Church, with an official residence in Washington. Mgr. Satolli has written several valuable works, among them a commentary on St. Thomas Aquinas, and a Course in Philosophy, much used in Catholic institutions of learning. He was elevated to the cardinalate in 1895, and was recalled and succeeded by Archbishop Sebastiano Martinelli in 1896.

SA TRAP, in the ancient Persian monarchy, was the governor of a province.

SATSUMA, a province in the south of Japan, on the island of Kiushiu. The ancient possessions of the hereditary lords of Satsuma extended over a large part of Kiushiu, but from the 16th c. their fief was greatly restricted. They were humbled by Taiko, and again by Iyeyasu. In 1609 they conquered and occupied the Loo Choo islands. Always restive and jealous of the Yedo usurpation, they were the first to rise against it in the restoration of 1868, since which time, having handed over their power to the mikado, their lands have formed the Kagoshima *ken* or prefecture, after the name of their chief city, at which Xavier first landed in 1549, and which in 1863 was bombarded by a British fleet, in revenge for the killing of a British subject near Yedo, by men in the procession of Shimadzu Saburo. An indemnity of \$500,000 was paid the British. In 1877 about 30,000 rebels, mostly from Satsuma, actuated by the idea that Japan was dishonored by not going to war with Corea, and that the mikado's ministers in Tokio were ruining the country by extravagance and oppression, rose in arms against the imperial government. To suppress this rebellion cost the nation 20,000 lives and \$50,000,000. The surface of Satsuma is mountainous, and the soil not very good; but manufactures and commerce flourish, and the mines are rich. Satsuma faience has long been noted for the richness of its gilding and painted decoration. The white clay was first discovered in 1624, and the characteristic decoration in gold and bright colors began about 1690.

SATTERLEE, HENRY YATES, D.D., b. New York, 1843; graduated from Columbia coll., 1863, and from the General theol. sem., 1866. He was called to the rectorship of the Prot. Epis. church at Wappinger's Falls, N. Y., which charge he held until 1882, when he was called to Calvary church, New York. He was elected bishop of the diocese of Michigan in 1889, but declined the post, and was elected bishop of the new diocese of Washington in 1895 and accepted.

SATURDAY, the seventh and last day of the week, receives its name from the Latin *des Saturni* (Saturn's day). It is the Jewish Sabbath; and it is held by many that the application of that name to the Lord's day (Sunday) is incorrect.

SATURN, an ancient Italian divinity, who presided over agriculture. His name, from the same root as *satum* (*sero*, to sow), indicates what was probably one of the earliest personifications in the Italian religion, Saturn being the god who blessed the labors of the sower. His identification with the Greek KRONOS by the latter Græcising myth-mongers is a peculiarly infelicitous blunder, and has led to more than ordinary confusion. The two have absolutely nothing in common except their antiquity. The Greek *Demeter* (Ceres), it has been observed, approaches far more closely to the Italian conception of the

character of Saturn. The process of amalgamation in the cases of Kronos and Saturn is visible enough. First, there is the Greek myth. Kronos, son of Uranos (heaven) and Gæa (earth), is there the youngest of the Titans. He married Rhea, by whom he had several children, all of whom he devoured at birth except the last, Zeus (Jupiter), whom his mother saved by a stratagem. The motive of Kronos for this horrible conduct was his hope of frustrating a prophecy which declared that his children would one day deprive him of his sovereignty, as he had done in the case of his father Uranos; but fate is stronger even than the gods, and when Zeus had grown up, he began a great war against Kronos and the Titans, which lasted for ten years, and ended in the complete discomfiture of the latter, who were hurled down to Tartarus, and there imprisoned. So ran the common myth. But other myths added, that after his banishment from heaven, Kronos fled to Italy, where he was received hospitably by Janus, who shared his sovereignty with him. At this point the Greek myth coalesced with the Italian. Saturn, the old homely deity of the Latin husbandmen, was transformed into a divine king, who ruled the happy aborigines of the Italian peninsula with paternal mildness and beneficence, taught them agriculture and the usages of a simple and innocent civilization, and softened the primitive roughness of their manners. Hence the whole land received from him the name of *Saturnia*, or "land of plenty." His reign was that "golden age," of which later poets sang as the ideal of earthly happiness, and in memory of which the famous *Saturnalia* (q.v.) were thought to have been instituted. At the foot of the Capitoline, where the fugitive god had formed his first settlement, there stood in historical times a temple dedicated to his worship. Ancient artists represented him as an old man, with long, straight hair, the back of his head covered, his feet swathed in woolen ribbons, a pruning-knife or sickle-shaped harp in his hand. Other attributes, as the scythe, serpent, wings, etc., are of later invention.

SATURN (see PLANETS). The mean distance of Saturn from the sun is 872,137,000 m., but the greatest and least distances differ nearly 49,000,000 m., being 920,973,000 and 823,301,000 miles. The eccentricity of his orbit is 1.055996, and he completes a circuit around the sun in a period of 29 years 167.2 days. While the volume of Saturn is 700 times that of the earth his mass is only about 90 times as much; his density being less than that of any other planet or planetoid. Taking the earth's density as unity, Saturn's is 0.13. Compared to the density of water, that of Saturn is as 73 to 100. His mean diameter is about 70,000 m., with a polar compression of about $\frac{1}{10}$, so that the polar diameter is about 66,500, and the equatorial about 73,500 miles. The rings of Saturn are his most remarkable characteristics. The breadth of the system of rings from the outside of the larger to the inside of the smaller is about 29,900 m., and the diameter of the outer ring is 167,000 miles. Three rings are usually counted, as with ordinary telescopic power they present that appearance, but increased power together with calculations made upon the effects of light make it probable that each of these three rings is subdivided into numerous others. Inside of the system of bright rings, there is a dark ring having a breadth of 87,000 miles, or more than the diameter of the earth. It was discovered by the elder Bond of Harvard university. This is also probably a multiple ring, and the inner diameter is about 90,000 m., leaving a space of about 10,000 m. between the innermost dark ring and the surface of the planet. In regard to the subdivision of the rings, recent investigations have made it probable that they are composed of numerous small satellites mingled with vaporous matter traveling in planes. The bright rings of Saturn were discovered by the Dutch astronomer Huygens in 1659. He had already discovered one of the satellites with a telescope of his own construction, having a focal length of 10 feet. The instrument with which he discovered the ring had a focal length of 23 feet, and was much the largest telescope ever constructed up to that time. The appearance of two luminous bodies on either side of the planet at various times had been observed by Galileo, but his telescope did not permit him to make out what the phenomena were. Huygens ascertained that the luminous appearances were caused by the reflection of the sun on two parts of the rings. From a calculation made from the position of the rings and the planet's revolution, he predicted the return of the luminous appearances in 1671, a prediction which was verified. The late prof. Peirce of Harvard came to the conclusion that the major planets must be still in a state of intense heat. Sir W. Herschel, Bond, Airy, and others also observed that changes of figure took place, consisting of bulgings out of regions corresponding to our temperate zones, with depressions at the poles and equator, or elevation of one polar region with depression of the other. This is accounted for by supposing the existence of great and dense cloud masses in the atmosphere of the planet. See *illus.*, vol. XIV., p. 80.

SATURNALIA, an ancient Italian festival, instituted, according to the common belief of the ancients, in memory of the happy reign of Saturn (q.v.). Discarding all mythical explanations of the institution of the Saturnalia as simply incredible, and not worth the trouble of refutation, we may rationally conjecture that the Saturnalia was a rural festival of the old Italian husbandmen, commemorative of the ingathering of the harvest, and therefore of immemorial antiquity. It is not, we conceive, to be doubted for a moment that the untrammelled jollities of the Saturnalia were familiar to the farmers of Latium long before their homely national god, who blessed the labors of seed-time with abundant fruit, had been decorated with incongruous Hellenic honors, and transformed into a

skye Titan. Later ages may have introduced novel elements into the Saturnalia befitting the hybrid myth of king Saturn, but originally no thoughtful investigator can doubt that the cessation from toil, and the wild self-abandoning mirth that marked the feast, were expressive of the laboring man's delight that the work of the year was over, and not an artificial enthusiasm for a "golden age" that never had been. The great feature of the Saturnalia, as we know the festival in historical times, was the temporary dissolution of the ordinary conditions of ancient society. The distinctions of rank disappeared or were reversed. Slaves were permitted to wear the *pileus*, or badge of freedom, and sat down to banquets in their master's clothes, while the latter waited on them at table. Crowds of people filled the streets, and roamed about the city in a peculiar dress, shouting *Io Saturnalia*; sacrifices were offered with uncovered head; friends sent presents to each other; all business was suspended; the law courts were closed; school-boys got a holiday; and no war could be begun. During the republic the Saturnalia proper occupied only one day—Dec. 19 (xvi. Kal. Jan.). The reformation of the calendar by Julius Cæsar caused the festival to fall on the 17th (xvi. Kal. Jan.), a change which produced much confusion, in consequence of which the emperor Augustus ordained that the Saturnalia should embrace the whole three days, Dec. 17, 18, and 19. Subsequently the number was extended to five, and even seven, though even in the times before the empire, it would appear that the amusements often lasted for several days. But while the whole week was regarded in a general sense as devoted to the Saturnalia, three distinct festivals were really celebrated—the Saturnalia proper; the *Opalia*, in honor of *Ops*, the wife of Saturn, and the goddess of field-labor (from *opus*, work; and the *Sigillaria*, in which *sigilla*, or little earthenware figures, were exposed for sale, and purchased as children's toys. The modern Italian carnival (q.v.) would seem to be only the old pagan Saturnalia baptized into Christianity.

SATURNIAN VERSE, the name given by the Romans to that species of verse in which their oldest poetical compositions, and more particularly the oldest national poetry, were composed. In the usage of the later poets and grammarians the phrase has two different significations. It is applied in a general way to denote the rude and unfixed measures of the ancient Latin ballad and song, and perhaps derived its name from being originally employed by the Latin husbandmen in their harvest-songs in honor of the god Saturn (q.v.). In this sense it simply means *old-fashioned*, and is not intended to determine the character of the meter. It is also applied to the measure used by Nævius, and a common opinion, sanctioned by the great name of Bentley, is that it was a Greek meter introduced by him into Italy. But though the Saturnian verse is found among the measures employed by Archilochus, scholars generally incline to the opinion that this is an accidental coincidence, that the measure of Nævius is of Italian (Hermann even thinks of Etruscan) origin, and that it merely improved on the older ballad-meter—the primitive Saturnian verse. It continued in use down to the time of Ennius (q.v.), who introduced the hexameter (q.v.). According to Hermann, the basis of the verse is contained in the following *schemata*:

— — — — — | — — — — —

which, as Macaulay happily points out, corresponds exactly to the nursery rhyme,

The queen was in her párlor | éating bréad and hóney,

and is frequently found in the Spanish poem of the *Cid*, the *Nibelungen Lied*, and almost all specimens of early poetry; but in the treatment of it a wide and arbitrary freedom was taken by the old Roman poets, as is proved by the still extant fragments of Nævius, Livius Andronicus, Ennius, and of the old inscriptionary tables which the *triumphatores* set up in the capitol, in remembrance of their glorious achievements.—See *History of Roman Literature*, by Thompson, Arnold, Newman, etc. (*Encyclopædia Metropolitana*, 1852); Browne's *History of Classical Roman Literature* (1853); Niebuhr's *History of Rome*; Preface to Macaulay's *Lays of Ancient Rome*; and Sellar's *Roman Poets of the Republic* (1863; new ed. 1881).

SATYRIASIS (see SATYRS) is the insanity, or the ungovernable sway of the lowest instincts and propensities, by which man becomes an animal in its savage and excited state. The ancients were acquainted with this loathsome form of alienation, in which man is the sport of foul and dangerous instincts, and recognizes no law or hindrance to the promptings of hunger, thirst, or lust. It still appears at puberty and in dotage, but is more rarely met with; and its disappearance may be hailed as significant of the predominance of the higher sentiments, or of the subjection of propensities to law, decency, and decorum.

SATYRS, in Greek mythology, were a race of woodland deities, first mentioned by Hesiod, who designates them—"the race of worthless satyrs unfit for work." Subsequently they figure in great numbers in the train of Dionysus (Bacchus)—their leader being that model of tipsy revelers, the never-sober Silenus! In appearance they were at once grotesque and repulsive, like all old woodland demons. They are described as robust in frame, with broad snub noses, large pointed ears like those of animals (whence they are sometimes called *theres*, "wild beasts"), bristly and shaggy hair, rough skin, little horny knobs on their foreheads, and small tails. The satyrs are of course sensual

in their inclinations, and ravishers of the woodland nymphs, fond of music, dancing, wine, and of the deep slumbers that follow a debauch. The Roman poets identified them with the *fauni* of their own mythology, and gave them larger horns and those goats' feet with which they are so often represented. Ancient sculpture was fond of the satyr as a "subject"—one of the most famous specimens of ancient art being the "Satyr" of Praxiteles (q. v.).

SAUCES are preparations of various condiments, used for the purpose of giving piquancy and flavor to various kinds of food, chiefly animal. Sauces have been in use from the earliest times of culinary art. The ancients prided themselves much upon them, and used them almost wholly with fish. Sauces were used by the Greeks, but seem to have arrived at the summit of their reputation in the time of the Roman empire, when that called *garum*, made from a fish called *garon* by the Greeks, probably the anchovy, was considered one of the greatest luxuries of the table. Besides the *garum*, many other sauces were made of the tunny and other fishes. In modern times we have sauces in great variety: there are those ready prepared, as Harvey's, Worcestershire, Yorkshire Relish, etc., the basis of which is ketchup (q. v.), which of itself is one of the most extensively known sauces; and there are a large number prepared, when wanted, by the cook, to suit every kind of dish sent to the table. These usually consist of rich gravies, thickened with flour or other materials, and flavored with some suitable condiment. One of the reproaches of British cookery is the extensive use of a sauce called melted butter, which is usually little better than bill-stickers' paste, and which at the best is a little flour, water, and butter warmed together, and well mixed; and it is the habit to serve this to almost every kind of dish needing a sauce, whether animal or vegetable.

SAUCISSON, or **SAUSAGE**, is a fascine of more than the usual length; but the principal application of the term is to the apparatus for firing a military mine. This consists of a long bag or pipe of linen, cloth, or leather, from 1 in. to 1½ in. in diameter, and charged with gunpowder. One end is laid in the mine to be exploded; the other is conducted through the galleries to a place where the engineers can fire it in safety. The electric spark is now preferred to the saucisson. See **BLASTING**.

SAUERKRAUT, a preparation of the common white cabbage, well known and in extensive use in Germany and the n. of Europe, where it supplies during the winter the place of fresh vegetables. The cabbages are gathered when they have formed firm white hearts; and these, sliced into thin shreds, are placed in a succession of thin layers in a cask, each layer being sprinkled with fine salt, to which some add juniper berries, cumin seed, caraway seeds, or other condiment. A board is then placed on the top, with a heavy weight, so as to press the whole down firmly, but gently. After a time, fermentation begins; and when a sour smell arises from the cask, it must be removed into a cool place, and kept for use. It is generally eaten boiled, in the same way as fresh cabbage.

SAUGERTIES, a town and village in Ulster co., N. Y.; on the Hudson river and the West Shore railroad; 12 miles n. of Kingston. It contains a high school, public and school libraries, Y. M. C. A., national, state, and savings banks, electric lights and electric street railroads, has manufactories of paper, wood-pulp, and brick, and iron works. The village is at the mouth of Esopus creek, and has fine water-power, and a large business in the shipment of limestone and bluestone. Pop. '90, town, 10,436; village, 4237.

SAUGOR, a t. of India, the chief town of a district in the central provinces, is situated in a hilly tract on the Bees, or Bes, a feeder of the Jumna, in lat. 23° 50' n., and long. 78° 45' east. Saugor is the seat of a military cantonment and of a prison. The elevation is so considerable that the climate is moderately cool; but the cantonment is unhappily in a swampy and unhealthy situation. There is some trade in salt. Pop. '91 of town, 44,674.

SAUK, a co. in s.w. central Wisconsin, bounded on the n.e., s., and s.e. by the Wisconsin river, drained by the Baraboo river, traversed by the Chicago, Milwaukee and St. Paul, and the Chicago and Northwestern railroads; area, 837 sq. m.; pop. '90, 30,575, chiefly of American birth. The surface is moderately hilly and heavily wooded. The soil is fertile. The principal productions are corn, hops, hay, oats, wheat, and live stock. Co. seat, Baraboo.

SAUL, the first king of Israel, was the son of Kish, a wealthy chief of the tribe of Benjamin. The circumstances that marked his election to the royal dignity are familiar to all the readers of Scripture, and need not be repeated here (see **JEWS**, **SAMUEL**). Gigantic in stature, noble in mien, and imperious in character, he appeared admirably fitted to accomplish the task of consolidating the dislocated tribes of Israel. His earlier achievements augured hopefully for his future. The deliverance of the men of Jabesh Gilead; above all, his victories over the Philistines, the Moabites, Ammonites, Edomites, and Amalekites, were unmistakable proofs of his vigorous military capacity, but gradually there showed itself in the nature of the man a wild perversity—"an evil spirit of God," as it is called—culminating in paroxysms of insane rage, which led him to commit such frightful deeds as the massacre of the priests of Nob. Samuel, who had

retired from the "court" of Saul, and had secretly anointed David as king, did not cease to "mourn" for the wayward monarch; but nothing availed to stay his downward career, not even the noble virtues of his son Jonathan; and at last he fell in a disastrous and bloody battle with the Philistines on Mount Gilboa.

SAULCY, LOUIS FÉLICIEN JOSEPH CAIGNART DE, b. Lille, France, 1807; educated at the Paris polytechnic school, and entered the artillery service. In 1836 he was awarded the numismatic prize of the French institute, having before that obtained a high reputation as an antiquary. He was made conservator of the museum of artillery at Paris. He devoted himself especially to oriental numismatics and antiquities; made explorations in Palestine, and claimed to have discovered the ruins of Sodom. D. 1880.

SAULSBURY, ELI, b. Kent co., Del., 1817. He took a special course at Dickinson coll., Penn., and afterwards graduated at law. He was a member of the Del. legislature, 1853-4; was elected, as a dem., to the U. S. senate, 1871, and was re-elected, 1876 and 1883. He died in 1893.

SAULT DE SAINTE MARIE, city and co. seat of Chippewa co., Mich.; on St. Mary's river, St. Mary's Falls ship-canal, and the Minneapolis, St. Paul, and Sault de Sainte Marie, and the Duluth, South Shore, and Atlantic railroads; opposite a village of the same name in Canada, with which it is connected by an international railroad bridge, putting the city into communication also with the Canadian trunk lines. The city has electric light, electric street railroad, water and sewerage plants, a branch state fish hatchery, shipyard and marine railway, many saw and lumber mills, and manufactories of flour, machinery, cigars, brick, and shingles. Pop. '90, 5760.

SAUMAREZ, JAMES, Baron de, a celebrated naval hero, was descended from an old French family, which had long been settled in Guernsey, and was born there Mar. 11, 1757. He entered the navy as midshipman at the age of 13, and served in the American war (1774-82), receiving for his gallantry at the attack of Charleston (1775) the grade of lieutenant; but he was recalled before the end of this war, and placed under sir Hyde Parker. He did good service in the action off the Dogger Bank (Aug., 1781), and was rewarded with promotion to the rank of commander, being soon afterward placed under the orders of Admiral Kempenfeldt on the Jamaica station. At the great fight between Rodney and De Grasse (April 12, 1782), Saumarez commanded the *Russell*, a line-of-battle ship, and gained much distinction by his coolness and intrepidity throughout. For his gallant capture of the French frigate *La Reunion*, with one inferior in size and equipment, he received the honor of knighthood; and in command of the *Orion*, a seventy-four, he served under lord Bridport at the battle of l'Orient, June 23, 1795. He also took a prominent part in the battle off cape St. Vincent (Feb. 14, 1797), and was second in command at the battle of the Nile, in which he was severely wounded. In 1801 he became a baronet, and vice-admiral of the blue; and in the same year fought his greatest action off Cadiz (July 12), defeating a French-Spanish fleet of 10 line-of-battle ships and 4 frigates, with a squadron less than half their strength, and causing to the enemy a loss of 3,000 men and three ships. This contest, than which, according to admiral Nelson, "a greater was never fought," gained for Saumarez the Order of the Bath, the freedom of the city of London, and the thanks of parliament. In the Russian war he commanded the Baltic fleet, and took or destroyed two large Russian flotillas (July, 1809). In 1814 he became admiral, vice-admiral of Great Britain in 1821, was created a peer in 1831, and died at Guernsey, Oct. 9, 1836. His life has been written by sir John Ross (*Memoirs of Admiral Lord de Saumarez*, 2 vols., 1838).

SAUMUR, a t. of France, on the left bank of the Loire, in the department of Maine-et-Loire, 30 m. s.e. of Angers by railway. Bridges connect the town with a suburb on the right bank of the river. The riverside is lined with handsome quays, and there are good bridges and agreeable promenades. The hôtel-de-ville and the castle are prominent buildings. Rosaries of cocoa-nut shells, linen, cambric, and articles in enamel are manufactured. The trade of Saumur is in spirits, corn, wines, hemp, and linen. Pop. '91, 12,825.

SAUNDERS, a co. in e. Nebraska, bounded on the n. and e. by the Platte river; drained by Saline, Cottonwood, and other creeks; traversed by the Union Pacific and other railroads; about 740 sq. m.; pop. '90, 21,577, chiefly of American birth. The surface is level, with little timber. The soil is fertile. The principal productions are corn, wheat, oats, and hay. Co. seat, Wahoo.

SAUNDERS, EPHRAIM DOD, D.D., 1808-72; b. N. J.; graduate of Yale college, 1831; studied theology at Princeton, and was settled over a Presbyterian church in Virginia for many years. After residing for a short time in Pottstown, Penn., and making the tour of Europe, he returned to Pennsylvania and founded the Saunders institute at West Philadelphia in 1857. In 1871 he founded the Presbyterian hospital of Philadelphia, by the presentation of the buildings and grounds of the institute, and raising \$100,000 additional by subscription; the new institution to be for a memorial to his son Courtland, author of *A New System of Latin Paradigms, with a Synopsis of Declensions*, 1860, who fell at Antietam fighting in the Union army, 1862, aged 21.

SAUNDERS, FREDERICK, b. London, 1807; commenced the publishing business in New York, 1836; was for a time assistant editor of the *Evening Post*: assistant librarian of the Astor library 1859-76, and librarian, 1876-96, when he presented the trustees with a MS. history of the library on which he had worked for many years. Among his published writings, *Salad for the Solitary*, and *Salad for the Social*, have been especially popular, and have been printed in London as well as in New York.

SAUNDERS, PRINCE, 1775-1840; a negro, b. Thetford, Vt. Having obtained a competent education he taught school in Colchester, Conn. and afterward in Boston. In 1807 he went to Hayti, and soon afterward was sent to England by Henri Christophe, president of the republic, to obtain books, teachers, and school apparatus. After this Saunders returned to the United States, studied divinity, and ministered acceptably to a church in Philadelphia. He was also a lawyer, and revisiting Hayti he was appointed attorney-general, in which capacity he framed the criminal code of the republic, as useful for the Haytiens as the code Napoleon was for the French. He published the *Haytien Papers* and several smaller works; and died in Hayti in 1840.

SAUNDERSON, NICHOLAS, LL.D., a distinguished English scholar, was b. at Thurleston in Yorkshire, in 1682. He became blind from small-pox at the age of twelve months, but received a good education, including instruction in the classics, which was orally communicated. His strong predilection for mathematics becoming known to his friends, attempts were made with success to instruct him in arithmetic, geometry, and algebra, by means of ingenious mechanical contrivances which it is not necessary to describe. In 1707 he came to Christ's college, Oxford, as a teacher, and there delivered a series of lectures on the Newtonian philosophy, including (strange to say) a discussion of Newton's theory of optics. Four years afterward he succeeded Whiston as Lucasian professor, and died April 19, 1739. A valuable and elaborate treatise on algebra, from his pen, was published in 1740 (2 vols., 8vo), and another on fluxions, including a commentary on some parts of Newton's *Principia*, in 1756. The mental process by which he was enabled to understand the rules of perspective, the projections of the sphere, and some of the more recondite propositions of solid geometry, seems to have been peculiar to himself, and was almost wholly unintelligible to others.

His sense of feeling was extremely acute; and he is said even to have been able to distinguish, by this sense alone, true Roman medals from counterfeits. He could judge fairly of the size of a room and of his position in it by the sound of his own footsteps, and could tell, in some inexplicable manner, when light clouds were passing across the sun's disk.

SAURIA, in the systems of Cuvier and other recent naturalists, an order of reptiles (q.v.), having an elongated body, covered with scales or with bony plates: a more or less elongated tail; four limbs, or sometimes only two apparent, the rudimentary hind-limbs being concealed beneath the skin; the mouth always furnished with teeth; the ribs movable, rising and falling in respiration; the young issuing from the egg in a form similar to that of the mature animal.—To this order belong crocodiles, alligators, etc.; chameleons, geckos, iguanas, agamas, varans, teguixins, lizards, skinks, etc., numerous families, some of which contain many genera and species. Crocodiles and their allies, being covered with bony plates instead of overlapping scales, are by some naturalists removed from among the saurians, and a place nearer to the chelonians is assigned to them. In their general form and structure, however, they correspond with saurians, and have no resemblance to chelonians. The recent sauria are far excelled in size and in variety of strange forms by the fossil sauria as the *plesiosaurus*, *ichthyosaurus*, etc.

SAURIN, JACQUES, a celebrated French Protestant preacher, was b. at Nîmes, Jan. 6, 1677, studied at Geneva, and was chosen minister of a Walloon church in London in 1701. But the climate of England did not agree with his delicate health; and in 1705 he settled at the Hague, where his extraordinary gift of pulpit oratory was prodigiously admired, but not by his clerical brethren, who enviously assailed him with the accusation of heresy. The ground of their charge was that Saurin had attributed falsehood to God. Commenting in a thesis on the conduct of Samuel (1 Sam. chap. xvi.) when about to proceed to Bethlehem to anoint David, Saurin had pointed out that God certainly induced the prophet to adopt such measures and such language as could not but lead king Saul to believe what was not true. He argued, however, that the "will of God" can never command what is criminal or wrong, and that this deception—this falsehood, as men would call it—was quite innocent and permissible. Saurin's logic is not perhaps quite faultless, but he at least deserves credit for not denying the existence of a moral difficulty. The dispute was carried to the synod of Hague, and Saurin was subjected to a series of petty persecutions that shortened his days. He died at the Hague in 1730. As a preacher, Saurin has often been compared with Bossuet, whom he rivals in force, if not in grace and subtlety of religious sentiment. His chief productions are: *Sermons sur divers Textes de l'Ecriture Sainte* (La Haye, 1708-25); *Nouveaux Sermons sur la Passion* (Rotterdam, 1732); *Discours sur les Evénements les plus mémorables du V. et du N. T.* (Amst. 1720-28); *Abbrégé de la Théologie et de la Morale Chrétiennes en Forme de Catéchisme* (Amst. 1722); and *État du Christianisme en France* (La Haye, 1725).

SAUROID FISHES, a name sometimes employed to designate fishes which approach in their structure to saurian reptiles. Of recent sauroid fishes examples are found in

bony pikes (q.v.) and sturgeons (q.v.). Fossil sauroid fishes are numerous, some of them of very large size. The teeth of *megalicthys* are nearly 4 in. in length, far exceeding those of any existing fish, and bony plates of the same fish have been found 5 in. in diameter.

SAUROPSIDA, a division of vertebrata, established by Prof. Huxley to include the birds and reptiles, which he with others considers to have so many affinities as only to be separated by class distinctions. The common anatomical characteristics in this division are the absence of gills, the possession of an amnion and allantois, the articulation of the skull with the vertebral column by a single occipital condyle, the composition of each branch of the lower jaw of several pieces, the articulation of the lower jaw with the skull by the intervention of a bone called the *os quadratum* or four-sided bone, and the possession of nucleated red blood corpuscles. See VERTEBRATA.

SAURY PIKE, *Scomberesox*, a genus of fishes of the order *pharyngognathi* and family *scomberesocidae*, having the body greatly elongated, and covered with minute scales; the head also much elongated, and the jaws produced into a long sharp beak, as in the garfish (q.v.); from which, however, the present genus differs in the division of the dorsal and anal fins into finlets, as in mackerels. One species (*S. saurus*) is common on the British coasts. It is about 15 in. long, the back dark-blue, the under parts white; the fins dusky-brown. It approaches the coast, and enters firths in shoals, which are pursued by larger fishes, porpoises, etc.; and in order to escape from these, the saury pike often leaps out of the water, or rushes along the surface, for a distance of 100 ft. scarcely dipping or seeming to touch the water. Hence the name SKIPPER, which it very commonly receives on the British coasts. Vast shoals sometimes enter bays, so that they may be taken by pailfuls, and great numbers are sometimes found among the sludge at the ebbing of the tide, in the upper parts of the firth of Forth and elsewhere. The flesh of the saury pike is palatable.

SAUSAGE, a well-known preparation of the flesh of various animals for culinary purposes. It is made by chopping the raw meat very fine, adding salt and other flavoring materials, and often bread-crumbs also, the whole forming a pasty mass. This is pressed into portions of the intestines of the animal, previously thoroughly cleaned and properly prepared. Usually, a considerable length of the intestine is filled and divided into separate sausages, by constricting it with pieces of string, at short intervals. The sausages of Lucania were very celebrated among the Romans.

SAUSAGE-POISON. See TRICHINIASIS.

SAUSSIER, FÉLIX GUSTAVE, French general, born Jan. 16, 1828, at Troyes. He became an officer in an infantry regiment in 1850, took part in the Crimean war, the Italian war of 1859, the Mexican expedition, and a campaign in Africa, and in 1869 was made colonel. In 1870 he commanded one of the regiments belonging to the garrison of Metz. He was taken prisoner, but escaping through Austria and Italy, returned and joined the army of the Loire. In Nov., 1873, he was returned as deputy for the department of Aube, and in the national assembly adhered to the left center, taking an active share in all questions of military reform. In 1878 he was promoted to lieutenant-general, in 1881 was commander-in-chief of the army in Algeria, and in 1884 was appointed military governor of Paris. In case of war he has supreme command of the French Army.

SAUSSURE, HORACE BENEDICT DE, a celebrated Swiss physicist and geologist, was b. at Conches, near Geneva, Feb. 17, 1740. His education was attended to with such success that, in 1762, young Saussure obtained the chair of physics and philosophy in the university of Geneva. In 1768 he commenced the famous series of journeys which were fraught with such important consequences to science and to his own reputation; and during the course of which he visited the Jura and Vosges mountains, those of Germany, England, Italy, Switzerland, Sicily, and the adjacent isles; the extinct craters of Auvergne, etc.; and traversed the Alps no less than 14 times, crossing them by 8 different routes. He was the first "traveler" who ever ascended to the summit of Mont Blanc; he camped for 17 days on the Col du Géant, and finished his Alpine achievements by the ascent of Monte Rosa in 1789. During this extensive course of travel, he made numerous observations on the minerals, physical features, botany, and meteorology of the mountain ranges he visited; and these observations were found, after having undergone a searching examination, to be as correct and valuable as they were numerous. In short, they put the science of geology for the first time on a basis of fact. The work in which they are found is entitled *Voyages dans les Alpes*, etc. (Neufchatel, Geneva, Paris, 1779-96, 4 vols.), and is much admired for its accurate and splendid descriptions of Alpine scenery. His observations were not made without considerable preliminary labor, for he found it necessary to improve his thermometer, hygrometer, eudiometer, electrometer, anemometer, and to invent other two instruments—viz., the cyanometer and diaphanometer, before his investigations, which were conducted with much care and candor, produced satisfactory results. In 1786 Saussure resigned his chair; and in 1798 was appointed professor of natural history in the central school of the department of *Leman* (formed on the annexation of Geneva to France); but four years afterward, he was struck with paralysis, and after a long period of suffering, died at Geneva, Jan. 22, 1799. Besides the great work above mentioned, he wrote

numerous others, the chief of which are *Observations sur l'écorce des Feuilles et des Pétales* (1762); *De Præcipuis Errorum nostrorum Causis, ex Mentis Facultatibus Oriundis* (1762); *De Electricitate* (1766); *De Aqua* (1771); *Sur l'hygrometrie* (1783), which, according to Cuvier, is one of the most important contributions to science in the 18th c.; and in which Saussure set forth his discovery of the dilatation in bulk, and diminution in specific gravity, of air charged with moisture. His "Description of the Alps," a portion of his great work, was published separately in 1834, at Geneva and Paris.

SAUTRĀNTIKA is the name of the second of the four great schools or systems of Buddhism, the three others being called *Vaibhāshika*, *Mādhyamika*, and *Yogichāra*. They recognize the authority of the *Sūtrās* (q.v.), but reject that of the *Abhidharma*.—See C. F. Koepfen, *Die Religion des Buddha* (Berlin, 1857); and W. Wassiljew, *Der Buddhismus, seine Dogmen, Geschichte und Litteratur* (St. Petersburg, 1860).

SAVAGE, JAMES, LL.D., 1784–1873; b. Boston; graduated at Harvard, and was admitted to the bar. He was a member of the state executive council, of the constitutional convention of 1820, and of both branches of the legislature. He was a learned antiquarian, and president of the Massachusetts historical society. Among his publications are an edition of John Winthrop's *History of New England*, and a valuable *Genealogical Dictionary of the First Settlers of New England*.

SAVAGE, MINOT JUDSON, b. Norridgewock, Me., 1841; graduated at Bangor theol. sem., 1864, and was ordained in the Cong. ministry. In 1873 he became a Unitarian, was pastor of a church in Chicago, and was then called to Boston. In 1896 he became associate of the Rev. Dr. Collyer in New York. He is a very radical thinker, and has published, among other works, *Christianity the Science of Manhood* (1873); *The Religion of Evolution* (1876); *Light on the Cloud* (1879); *The Morals of Evolution*; *Life Questions* (1880); *The Modern Sphinx and some of her Riddles*; *Poems* (1883); *Beliefs about the Bible*; *Man, Woman, and Child* (1884); *Religion for To-day* (1897). He is an industrious writer and an interesting speaker, expending his chief strength, however, in attack.

SAVAGE, RICHARD, an English poet, was b. in London, Jan. 16, 1698. He was the fruit of an illicit intercourse between lord Rivers and the countess of Macclesfield, which resulted in the divorce of the lady, and the declared illegitimacy of her offspring. Lord Rivers, though permitting his name to be given to the child, seems not to have concerned himself further with him at all; and at the hands of his mother he met with only the grossest neglect. To the interference of her mother, lady Mason, he was indebted for his education, received at the grammar school of St. Albans. Afterward, he was apprenticed to a shoemaker in Holborn, but an accident revealing to him the secret of his birth, he quitted this obscure handicraft. Repeatedly and in vain he appealed to the tender sympathies of his mother, who declined even to see him, and withheld all acknowledgement and assistance. Failing other means of subsistence, he turned his attention to literature, and at an early age produced several comedies, which met with but little success. Somewhat more fortunate was his tragedy of *Sir Thomas Overbury*, which though indifferently received on the stage, with the author himself as actor of the leading part, obtained in print some approval, and put a little money in his purse. In 1727 he killed a man in a drunken tavern brawl—an offense for which he was tried, and sentenced to death. A pardon was, however, obtained for him on the intercession of the countess of Hertford with the queen, and the details of his story becoming widely known, a strong feeling arose in his favor. Though his mother continued inexorable, and would, it was thought, have been well pleased to be rid of him by the hands of the hangman, certain of her relations interested themselves in him, and he was received into the household of lord Tyrconnel, who allowed him £200 a year, and otherwise treated him with considerate generosity. His poem, *The Wanderer*, was now published; its success was great, and for a time the career of Savage was prosperous, and even brilliant. But it did not very long remain so. The inveterate irregularity of his habits involved him in difficulties with lord Tyrconnel, and they parted with mutual recriminations. After this, he sunk irretrievably. Though he failed in an attempt to obtain the post of poet-laureate, a poem which he wrote to commemorate her birthday so pleased the queen, that along with "a permission to write annually on the same subject," she conferred on him a pension of £50 a year. This sum, which might have been to him the basis of a modest subsistence, it was his regular habit to dissipate in a week's debauchery, passing the rest of the year in what disreputable fashion he could. On the failure of his pension by the death of the queen, a subscription was set on foot, mainly through the influence of Pope, with the view of sending him to live quietly at Swansea in Wales. Thither, accordingly, he retired; but happening to visit Bristol, where he lived in the reckless manner habitual to him, he was arrested for a debt of £8, and died in prison there, on July 31, 1743. The poetry of Savage, though a few vigorous lines of it continue to be remembered, is scarcely such as of itself would have sufficed for a permanent reputation. His most powerful and finished piece is *The Bastard*, in which he held his mother up to public execration. Such celebrity as still attends his name he owes, however, almost entirely to the life of him by Dr. Johnson, who, in the time of his own early struggles, was thrown much into his society.

SAVAGES, or **WILD MEN**, in heraldry, are of frequent occurrence as supporters. They are represented naked, and also, particularly in the later heraldry, are usually wreathed about the head and the middle with laurel, and often furnished with a club in the exterior hand. Savages are especially prevalent in the heraldry of Scotland.

SAVANNAH, a river which forms the boundary between Georgia and South Carolina, rises in the Alleghanies, on the south-western border of North Carolina, and flows s.e. to the Atlantic. Its length is 450 m., navigable to Augusta.

SAVANNAH, co. seat of Chatham co., Ga., and among Southern cities second only to New Orleans in commercial importance, is situated on a bold bluff of sand about 40 ft. above low water, on the s. side of the Savannah river, 18 m. from its mouth, and 115 m. by rail s.w. of Charleston, in lat. $30^{\circ} 5' \text{ n.}$, long. $81^{\circ} 8' \text{ w.}$ It has a water front of 3 m., and extends back from the river about 2 m. The yearly mean temperature is 66.76° , and its winter climate is delightful. The city, built chiefly of brick, is laid out with absolute regularity, all the streets crossing at right angles, but its wealth of semi-tropical shade-trees and the thirty-four small parks which are scattered throughout its extent prevent any impression of monotony. In the southern part of the city lies the beautiful Forsyth park (30 acres), having a fountain modeled after that of the Place de la Concorde, of Paris. The parade ground, which forms a part of this park, contains a fine monument to the memory of the Confederate dead. Johnson, or Monument square, has a Doric obelisk commemorating Gen. Nathanael Greene and Count Pulaski, and at Monterey square, on the very spot where he fell, there is a lofty shaft surmounted by a statue of Liberty unfurling the national banner, in memory of Pulaski. There is also in Madison square a monument to Sergeant William Jasper, of Revolutionary fame. Bonaventure cemetery, four miles south of the city, with avenues of live oaks, draped with long gray Spanish moss, is very impressive. Among the prominent edifices are the new county court house, Hodgson hall, containing the library and collections of the Georgia historical soc., custom house, city exchange, Oglethorpe club house, Chatham academy, Guards' arsenal, Telfair academy of arts, Cotton exchange, Convent of St. Vincent de Paul, St. Andrew's hall, the R. C. Cathedral, St. John's and Christ Episcopal churches, the Independent Presbyterian ch., and Mickva Israel synagogue. There are about 60 churches, a medical college, several hospitals, an orphan asylum, Epis. orphans' home, St. Joseph's infirmary, and other beneficent institutions. There are several foundries, rice-mills, cotton-compressors, planing-mills, a paper-mill, cotton factory, gas and water works, and street railways. The city is well supplied with public and private schools. Among the pleasant summer resorts in the vicinity is Tybee Beach, at the mouth of the river, much frequented for bathing. Bay street, a narrow street at the foot of the bluff, which overhangs the river, is the principal avenue for wholesale trade. The railroads entering the city are the Central of Georgia, the Florida Central and Peninsular, the Georgia and Alabama, and several branches of the Plant system. There are steamers to Boston, New York, Philadelphia, Baltimore, and Liverpool, as well as to various Southern cities. The harbor accommodates the largest sea-going vessels, and the river is navigable as far as Augusta. Savannah is the second city in the United States in the amount of its cotton exports. Its trade in lumber, rice, fertilizers, and naval stores is also large. The U. S. census of 1890 reported for Savannah, 244 manufacturing establishments, employing \$5,379,774 capital and 2,760 persons, paying \$1,362,120 for wages and \$3,297,804 for materials, and having a combined output valued at \$6,319,066. The imports of merchandise, 1896-7, aggregated \$415,900; exports, \$23,442,700.

Savannah was settled in 1733 by a colony of 130 persons from England, under the leadership of Gen. Oglethorpe. He wished to provide an asylum for Protestants of all nations, and especially for the poor debtors of England, for whom his sympathy had been aroused when, as Chairman of a Committee of the House of Commons, he visited the English prisons. During the three years following a considerable number of Moravians, Lutherans, and other Germans, and some Scotch Highlanders were added to the colony. It was captured by the British in 1778, and in the attempt by the French and American army to retake it, Oct., 1779, Count Pulaski lost his life. Savannah was incorporated as a city in 1789. It was ravaged by a great fire in 1796, and by another still more destructive in 1820. The first steamship to cross the Atlantic started from Savannah in 1819. The port was blockaded by the U. S. fleet from 1861-1865, and the city was captured by Gen. Sherman, Dec. 21, 1864. Its progress since the war has been very rapid. Pop. 1860, 22,292; 1870, 28,235; 1880, 30,709; 1890, 43,189.

SAVARY, ANNE JEAN MARIE RENÉ, Duc de Rovigo, a French gen. and diplomatist, was b. at Marcq, in Ardennes, April 26, 1774, entered the army as a volunteer in 1790, and served with distinction in the army of the Rhine. In 1797 he accompanied Desaix to Egypt as *chef d'escadron*, and remained under his command as long as that general lived. After the battle of Marengo (1800), Napoleon made him his aid-de-camp, and for several years employed him only in political affairs, for which he showed an admirable capacity. In 1803, he was made gen. of brigade; in 1804, as commandant of the troops stationed at Vincennes, he presided at the execution of the duc d'Enghien, an event which he is believed to have unduly hastened; and in the Prusso-Russian Austrian wars of 1806-08, he acquired high military reputation, his victory at Ostrolenka (Feb. 16, 1807) being really a brilliant achievement. Created duke of Rovigo in the beginning of the following year, he was sent to Spain by the emperor, and negotiated the perfidious arrangement by which the Spanish king and his son were kidnapped. In

1810, he replaced Fouché as minister of police. After the fall of Napoleon, to whom he had always been passionately, and, we may add, unscrupulously devoted, he wished to accompany him to St. Helena; but he was confined by the British government at Malta for seven months, when he succeeded in making his escape, and getting on board a ship, was landed at Smyrna. After experiencing several vicissitudes, he returned to Paris in 1818, and was reinstated in his titles and honors. In 1823 he removed to Rome; but at the close of 1831, he was appointed commander-in-chief of the army of Africa, and during his brief administration of affairs in Algeria, exhibited a splendid energy and generalship. But ill-health forced him to withdraw to France in Mar. 1833, and on June 2d following, he died at Paris. Savary's *Mémoires* (Par. 8 vols. 1828) are among the most curious and instructive documents relating to the period of the empire.

SAVE, a river of the s. of Austria, and an important affluent of the Danube, is formed by two upper waters, which rise in the extreme n.w. of Carniola, and unite at Radmannsdorf 1560 ft. above sea-level. The river then flows s.e. through Carniola, passing Laibach (at which point it becomes navigable), and forming in part the boundary between Carniola and Styria, after which it enters and traverses Croatia; and at its confluence with the Unna, first touches the Turkish dominions, the northern boundary of which it continues to form throughout the remainder of its course to its junction with the Danube at Belgrade. Estimated length, 660 miles. Its principal affluents are the Laibach (200 m. long), Kulpa, Unna, Bosna, and Drina.

SAVELOY, a kind of sausage common in the London shops; it only differs from pork sausages in being made of young *salted* pork, highly seasoned, and having a little salt-peter added to give the contents a red color.

SAVIGNY, FRIEDRICH KARL VON, an illustrious writer on Roman jurisprudence, descended from a French Calvinistic family, that had emigrated to Germany in 1622, to avoid religious persecution, was born at Frankfort on Feb. 21, 1779. He studied at Marburg, and took his degree in 1800, after which he commenced a series of lectures on juridical subjects, which were attended by a numerous auditory. Struck, in his exposition of the digest, with the divergence existing between the text and the commentaries on the theory of possession, he composed in 1803 his masterly treatise, *Das Recht des Besizes*, in which the Roman law is disengaged from the extraneous elements introduced into it by Germanic law, common usage, and the misapprehensions of commentators. Its merit was quickly recognized, and Savigny received the most advantageous offers from different universities, which, however, he declined, in order to prosecute researches in the libraries of France and Germany, with a view to a historical development of the glosses of commentators. He was assisted in this laborious undertaking by his pupil, Jakob Grimm, and his young wife, a daughter of the poet Clem. Brentano, and Bettina von Arnim. Appointed professor of law at Landshut in 1808, he was called, two years afterward, to Berlin, on the reorganization of the university, and there he continued to lecture with unbroken success for a period of 32 years, in the course of which he filled various important offices in the university and the state, and died Oct. 25, 1861, at the age of 82. Savigny is the virtual founder of the new historical school of writers upon jurisprudence, although it is but fair to admit that Hugo and Schlosser had preceded him in the same direction. The essential idea of this school is, that "law" or "right" is not an abstract and absolute rule, manifesting itself under the same forms in all countries, but that it is one of the forces of society, with which it changes, according to fixed laws of development that are beyond the caprices of the day. This idea, when worked out historically, has produced the most important and original results, and may even be said without exaggeration to have regenerated the science of jurisprudence. Savigny's principal writings are: *Vom Berufe unserer Zeit für Gesetzgebung und Rechtswissenschaft* (Heidelb. 1815); *Geschichte des Römischen Rechts im Mittelalter* (6 vols. Heidelb. 1826-31); *System des heutigen Römischen Rechts* (8 vols., Berl. 1840-48); *Das Obligationenrecht* (1851-53), and *Vermischte Schriften* (5 vols. Berl. 1850), a collection of essays which had originally appeared in the *Zeitschrift für Historische Rechtswissenschaft*, and elsewhere.

SAVILLE, Sir HENRY, 1549-1622; b. Yorkshire; entered Brasenose college, Oxford, and Merton college 1561; fellow of the university and voluntary lecturer on mathematics; proctor 1575-76. Subsequently he visited many places on the continent collecting MSS., and on his return was appointed Greek and mathematical tutor to queen Elizabeth 1578; provost of Eton 1596; knighted by James I. 1604; warden of Merton college 1585-1621. He founded at Oxford the Savilian professorships of geometry and astronomy 1619, and gave liberally to the institution besides the gift of his valuable library. He was the author of a translation of *The end of Nero and Beginning of Galba, fower Bookes of the Histories of Cornelius Tacitus*; and *The Life of Agricola, with Notes*. Oxford, 1581.

SAVILLE or **SAVILLE**, GEORGE, 1630-95, b. England; created marquis of Halifax in 1682. He was a confidential adviser of Charles II., who made him lord privy-seal. James II. dismissed him for his opposition to the repeal of the habeas-corpus and test acts. James appointed him a commissioner to treat with William of Orange, whom he supported on the meeting of parliament. He was at once made speaker of the house of lords, and William, soon after his accession, made him lord privy-seal. He soon

joined the opposition, and for a time affiliated with the Jacobites. He was the head of the so-called party of "trimmers."

SAVINE, *Juniperus sabina*, (see JUNIPER), a low, much-branched, and very widely-spreading shrub, with very small, imbricated, evergreen leaves, which grows on mountains in the s. of Europe and the east. It bears small black berries, covered with a pale blue bloom. Its foliage has a strong, fetid, aromatic, penetrating odor, particularly when rubbed. Its exhalations cause headache. The part of the plant used in medicine is the tops of the branches, collected in spring, and dried. Their odor is strong, peculiar, and unpleasant, and their taste acrid, bitter, resinous, and disagreeable. The therapeutic proprieties of savine are due to the volatile oil which it contains. Two pounds of the tops yield about five ounces of this oil, which is limpid and nearly colorless, having the odor of the plant, and a hot acrid taste. Its composition is $C_{10}H_8$, being isomeric with oil of turpentine.

Savine exerts a stimulating effect on the uterine organs, and is employed with much benefit in cases of amenorrhœa and chlorosis, depending upon want of tone in those parts. It is best given in the form of the oil, one or two minims of which may be prescribed in a pill, to be taken twice a day. This drug is often employed by the lower classes for the purpose of procuring abortion; but it ought to be generally known that if it is given in a sufficiently large dose to produce the desired effect, the life of the mother is placed in the greatest possible peril. If a poisonous dose has been given for this or any other object, emetics should first be employed to remove any of the drug that may remain in the stomach, after which opiates and demulcents should be prescribed, and a general cooling and lowering treatment adopted. Savine in the form of ointment is much used as an external application, with the view of keeping up the discharge from a blistered surface. The ointment cannot, however, be kept long without losing its properties.

SAVINGS-BANKS are institutions designed primarily for the purpose of receiving small deposits of money from the poorer classes and investing the same for the benefit of the depositors at compound interest. The first instance of an institution of this kind was one established at Brunswick in 1765. During the next thirty years others followed at intervals in various cities of Germany, France, and Switzerland. The savings-bank system in Great Britain owes its origin to an excellent though vague suggestion of Daniel Defoe in 1697. A century later Jeremy Bentham succeeded in enlisting philanthropic interest in a similar project, which received practical application in 1797, when the Rev. Joseph Smith opened a "Frugality Bank" at Wendover. The movement spread so rapidly that by the end of 1817 there were 78 savings-banks in England, Wales, and Ireland, and the funds deposited by their trustees in the Banks of England and Ireland amounted in the aggregate to £231,028. The same year Acts of Parliament were passed which provided for the management and control of all such organizations. The statistics for the next 40 years, reckoning by decades from Nov. 20, 1821, until 1861, when the post-office savings-banks were established, will be found in the following table:

YEAR.	Population.	Number of Depositors.	Percentage of Population.	Amount of Deposits.	Per Head of Population.
				£	£ s. d.
1821	20,893,584	Not known.	..	4,740,188	0 4 6
1831	24,028,584	429,400	2	14,698,635	0 12 3
1841	26,730,929	841,204	3	24,536,971	0 18 4
1851	27,390,629	1,161,888	4	30,445,568	1 2 3
1861	28,927,485	1,609,102	6	41,542,219	1 8 9

As far as trustee savings-banks are concerned, the provisions of the Acts of 1817 remain substantially the same, although the law has frequently been amended in matters of detail. Among many inducements to thrift, the original legislation offered a rate of interest (3d. per day, or £4 11s. 3d., per cent. per annum) to the depositor which was in excess of that given to the ordinary public creditor. In 1828 an Act was passed which reduced the rate of interest allowed to the trustees of savings-banks to 2½d. per day, or £3 16s. 0½d. per annum, and prohibited them from allowing more to their depositors than 2½d. per day, or £3 8s. 5½d. per annum, requiring them also to pay the surplus, if any, into a separate fund held by the National Debt Commissioners, but bearing no interest. In 1844 the maximum interest that a depositor might receive was fixed at £3 0s. 10d. per annum, and finally, in 1880, the interest to trustees was reduced to £3, and that to depositors to £2 15s. The legislation of 1817, however, proved bad political economy, for it was not until 1844 that the fund was about made self-supporting. Even after that period the past deficiency was still allowed to accumulate, and it was not until 1880 that the plan was adopted of voting the deficiency every year.

At first the limit of the amount that each depositor was permitted to pay in was fixed at £100 the initial year, and £50 a year afterwards. This was done primarily as a safeguard against the privilege of liberal interest being used by others than the classes whom

it was originally intended to encourage in thrift. In 1828 the limit was adopted which still remains in force, of £30 a year, or £150 in the whole, allowed by addition of interest to increase to £200, but no further. Frequent attempts since then to raise the annual limit to £50 have invariably been defeated. From returns published in 1852, it appears that less than two per cent. of the deposits, either in number or amount, were made by classes whom the legislature sought to exclude. The main feature of the savings-bank law is that the whole of the funds should be invested with the government through the Commissioners for the reduction of the national debt. The trustees, who are invested with the entire local management, are precluded from receiving any remuneration for their services or making any profit, and are obliged to furnish the commissioners with periodical returns of their transactions.

The establishment of a new savings-bank requires the consent of the National Debt Commissioners and the certificate of the registrar of friendly societies. Since the introduction of the post-office savings-banks, however, the number of trustee savings-banks has decreased continuously. Nevertheless, there can be no doubt that the larger and stronger banks which remain are more than able to hold their own. The number of savings-banks in the United Kingdom reached its maximum in 1861, when it was 645, with a total liability to depositors of £41,546,475. On the other hand, the amount of deposits reached its maximum in 1887, when the figures were £47,262,222, besides £943,126 of stock, and in 1893, 267 banks claimed deposits aggregating £42,225,801. The statistics of trustee savings-banks in decades, from 1859, with the addition of figures for the past four years, are as follows :

YEAR.	No. of Banks.	Average Rate of Interest paid to Depositors.	No. of Accounts remaining open.	Total Amount owing to Depositors.	Total Amount invested with Commissioners, excluding the separate Surplus Fund.	Total Amount of the separate Surplus Fund.	Total Amount of Government Stock standing to the Credit of Depositors.
		£ s. d.		£	£	£	£
1859	625	2 18 10	1,503,916	38,949,128	38,726,677	351,299	.....
1869	507	2 19 4	1,377,892	37,554,557	37,393,179	376,612	.....
1879	449	2 19 6	1,506,714	43,797,806	43,639,773	398,908	.....
1889	346	2 9 8	1,551,574	44,931,551	44,996,419	361,281	1,175,248
1890	324	2 9 7	1,535,782	43,614,056	43,522,137	360,480	1,280,069
1891	303	2 9 8	1,510,282	42,858,434	42,767,732	354,102	1,282,238
1892	281	2 9 7	1,501,920	42,385,032	42,267,672	358,948	1,281,891
1893	267	2 9 7	1,471,146	42,225,801	42,145,909	361,497	1,318,938

POST-OFFICE SAVINGS-BANKS.—The establishment of these popular and successful institutions in Great Britain was practically made possible by the suggestion of Mr. Charles William Sykes, of the Huddersfield Banking Company, in 1860. Mr. Gladstone, then Chancellor of the Exchequer, was one of the first to recognize the virtues of this scheme, which had been proposed originally by a Mr. Whitbread in 1807, and the gist of which was that the money-order branch of the post-office should be used for the collection and transmission of savings from all parts of the country to a central savings-bank to be located in London. When Mr. Sykes revived this proposal, the number of trustee savings-banks was 638, but of these only twenty throughout the kingdom were open daily, and 350 were open only for a few hours on a single day of the week. Twenty-four towns of over 10,000 inhabitants each and fourteen entire counties were without any savings-banks whatever. Owing largely to Mr. Gladstone's strenuous personal efforts in Parliament, the bill entitled "An Act to grant additional facilities for depositing small savings at interest, with the security of Government for the due repayment thereof," became law Sept. 16, 1861. In February, 1862, the Act was brought into operation both in Scotland and Ireland, and before the expiration of the next two years nearly all the money-order offices of the United Kingdom had become savings-banks. About 367,000 new deposit accounts were opened, representing an aggregate payment of £4,702,000, which included a sum of more than £500,000 transferred from trustee savings-banks. This simple and convenient system has met with universal favor. In 1867 the number of post-office savings-banks was 3629; that of depositors in them, 854,983; the amount standing to their credit, £9,749,729, and the average amount of each deposit, £2 18s. At the end of 1883 the number of banks was 7369; the number of depositors, 3,105,642, and the amount standing to their credit, £41,768,808. On the 31st of December, 1893, there were nearly 1100 banks and 5,748,239 depositors. Deposits of not less than one shilling may be made at any of the money-order offices. Each depositor is provided with a deposit book; each deposit is entered in this book, and is attested by the receiving officer and by the dated stamp of his office. The amount received is reported on the same day to the postmaster-general, and an acknowledgment is transmitted to the depositor, which is to be conclusive evidence of his claim to repayment with interest. The depositor is entitled to repayment of the whole or any part of the deposit, on making a demand in a prescribed form at any of

the offices within ten days at furthest after sending in the demand. All the moneys are paid into and received back from the national debt office, on the authority of the postmaster-general, who is obliged to act in concurrence with the treasury and the National Debt Commissioners. Interest at $2\frac{1}{2}$ per cent. is allowed on all deposits as soon as they amount to £1, but none on fractional parts of £1. Facilities are supplied by means of certificates for transferring deposit accounts from trustee savings-banks to post-office savings-banks, and *vice versa*. The maximum sum deposited by any one in one year is limited to £30. A detailed account of the proceedings is to be presented annually to Parliament. Any depositor in the post-office savings-bank can invest his deposit in government stock by making proper application to the controller of the savings-bank department, provided that the sum be not less than £10. Within seven days from the receipt of the application the depositor's account is charged with the current price of the stock purchased, together with the commission, the depositor receiving an investment certificate as evidence of the transfer.

Statement showing the Amount of the Computed Capital of Post-office and Trustee Savings-banks and Number of Depositors in the Banks at the end of 1875, 1880, 1885, 1890, 1891, 1892, and 1893.

	COMPUTED CAPITAL.			NUMBER OF DEPOSITORS.		
	Post-office Savings-banks.	Trustee Savings-banks.	Total.	Post-office Savings-banks.	Trustee Savings-banks.	Total.
	£.	£	£			
1875.....	25,200,000	42,400,000	67,600,000	1,777,103	1,479,192	3,256,295
1880.	*33,700,000	*44,000,000	77,700,000	2,184,972	1,519,805	3,704,777
1885.....	*47,697,888	*46,355,909	94,053,747	3,535,650	1,592,997	5,128,647
1890.....	*67,634,807	*43,650,552	111,285,359	4,827,314	1,535,782	6,363,096
1891.....	*71,608,002	*42,875,565	114,483,567	5,118,395	1,510,282	6,628,677
1892.....	*75,853,079	*42,385,449	118,238,528	5,452,316	1,501,920	6,954,236
1893.....	*80,597,641	*42,243,607	122,841,248	5,748,239	1,471,146	7,219,385

Annuities, immediate or deferred, are granted by the postmaster-general to any person not under five years of age for any sum not less than £1 or not more than £100. Conditions of contract in the case of annuities depend upon the age and sex of the purchaser; they also vary according as the purchase-money is to be returned or not. The postmaster-general will also insure the lives of persons of either sex between the ages of fourteen and sixty-five, inclusive, for any sum not less than £5 or more than £100; but where the amount does not exceed £5 the earlier limit of age is eight years. The premiums charged for insurance vary with the age of the insured and the mode in which the insurance is effected. The insured, if not under sixteen years of age, enjoys the right of nominating the person to whom the money due at his or her death is to be paid. The contracts for annuities and life insurances in connection with the savings-bank branch of the post-office began on the 17th of April, 1865.

In addition to the savings-bank systems already described, Great Britain has penny banks, army and navy banks, and railway banks, besides many private banks, which are unconnected with the government.

IN THE UNITED STATES.—The first savings-bank in the United States was organized in Philadelphia in December, 1816, under the title of the Philadelphia Savings Fund Society. It was simply a non-corporate association of a few benevolent individuals, formed for the purpose of receiving the surplus moneys of poor persons. Three years later the society was duly incorporated by the state of Pennsylvania. The state of Massachusetts, however, gave legislative sanction to a savings-bank as early as 1817. Maryland followed her example in 1818, New York, Pennsylvania, Maine, Connecticut, and Rhode Island in 1819, New Hampshire in 1823, Ohio in 1831, Delaware in 1832, New Jersey in 1839, and Vermont in 1846. Most of the other states granted charters to savings-banks at subsequent periods. For a long time all such institutions were created by special legislative acts; of late years, however, they have been incorporated under general laws. Originally organized and long conducted in a spirit of philanthropy that aimed to promote industry and thrift among working people, savings-banks have become the chosen depositories of a portion of the surplus moneys of all classes, and experience has demonstrated that by thus extending the area of operations these institutions have attained a degree of efficiency and strength that was manifestly impossible before. In 1834 the state of Massachusetts enacted a general law providing for the organization and supervision of savings-banks, and during the next 20 years legislation embracing most of the important measures which are active at this day was carried on in the majority of the other states. The following table of statistics illustrates the progress of the savings-bank system in the United States between the years 1820 and 1890.

* Exclusive of amounts of government stock purchased for depositors, and standing to their credit at the end of each year.

YEAR.	No. of Banks.	No. of Depositors.	Deposits.	Average due each Depositor.	Average per capita in the United States.
1820.....	10	8,635	\$1,138,576	\$131.86	\$0.12
1830.....	36	38,085	6,973,304	183.09	.54
1840.....	61	78,701	14,051,520	178.54	.82
1850.....	108	251,354	43,431,130	172.78	1.87
1860.....	278	693,870	149,277,504	215.13	4.75
1870.....	517	1,630,846	549,874,358	337.17	14.26
1880.....	629	2,335,582	819,106,973	350.71	16.33
1890.....	921	4,258,893	1,524,844,506	358.04	24.35

According to the New York law of 1875, many of the features of which have been adopted by the other states, the principal rules and regulations governing the management of savings-banks are as follows: No less than thirteen persons can organize a new institution, and authority must first be granted by the bank superintendent of the state. The board of trustees elect from their number a president and two vice-presidents, and also appoint such officers and clerks, whose salaries are fixed by the board, as they may see fit. No trustee or officer for himself, or as the agent or partner of others, can borrow the funds or deposits of the bank, or in any manner use the same, except to make current and necessary payments sanctioned by the board of trustees. Savings-banks are authorized by law to receive deposits from individuals or corporations, to invest the same, and pay interest or dividends thereon. The depositor is to be furnished with a pass-book, containing the rules and regulations of the bank, on the blank pages of which all deposits and withdrawals are required to be entered. The sums deposited, together with accumulations thereon, are required to be repaid to depositors or their legal representatives, after demand, in such a manner and at such times and after such previous notice and under such regulations as the board of trustees may prescribe. The usual provision is for 60 days' notice, which is only demanded in time of panic.

The rate of interest or dividends on deposits, not to exceed 5 per cent. *per annum*, is to be regulated in such a manner that depositors shall receive, as nearly as may be, all profits of the corporation after deducting necessary expenses, and reserving such amount as may be deemed expedient as a surplus fund for the security of depositors. When surplus exceeds 15 per cent. of deposits extra dividends may be declared.

The securities in which investments may lawfully be made include stocks or bonds of the United States, of the state of New York, or of its cities, counties, or towns; and under restrictions in bonds and mortgages on unincumbered real estate, etc. Every savings-bank is required to make a full report in writing of its condition at least twice in each year, verified by the oaths of the two principal officers of the bank.

AGGREGATE RESOURCES AND LIABILITIES OF SAVINGS-BANKS FROM 1888-89 TO 1892-93.

	1888-89.	1889-90.	1890-91.	1891-92.	1892-93.
RESOURCES AND LIABILITIES.					
	849 banks.	921 banks.	1,011 banks.	1,059 banks.	1,030 banks.
RESOURCES.					
Loans on real estate.....	\$567,373,144	\$634,229,417	\$687,583,977	\$714,832,576	\$763,579,985
Loans on personal, etc., security..	160,816,153	70,227,806	93,679,153	79,173,174	74,179,877
Other loans and discounts.....	74,551,588	182,091,574	198,134,045	229,711,725	209,014,835
Overdrafts.....	813,211	303,316	286,254	328,763	495,781
United States bonds.....	158,923,630	148,532,828	139,267,045	133,344,199	129,610,783
State, county and municipal bonds.	280,139,464	303,919,560	320,278,708	393,190,240	398,606,298
Railroad bonds and stocks.....	101,443,381	110,405,678	115,991,821	131,215,829	121,519,071
Bank stocks.....	42,263,654	43,735,762	45,038,830	48,688,739	44,466,725
Other stocks, bonds, and mort- gages.....	101,819,419	111,575,177	107,963,932	71,096,738	105,169,599
Due from other banks and bankers	61,534,576	65,126,477	70,660,882	81,576,253	83,007,108
Real estate, furniture, and fix- tures.....	29,652,572	30,211,272	30,438,232	33,097,998	34,615,359
Current expenses and taxes paid..	593,924	753,963	971,266	832,059	748,432
Cash and cash items.....	29,928,582	30,147,978	29,720,473	33,208,271	36,956,824
Other resources.....	12,758,967	11,356,193	14,502,451	18,748,297	11,804,470
Total.....	\$1,622,612,215	\$1,742,617,001	\$1,854,517,069	\$1,964,044,861	\$2,013,775,147
LIABILITIES.					
Capital stock.....	\$23,811,848	\$26,401,035	\$32,106,127	\$37,407,475	\$33,429,188
Surplus fund.....	127,225,533	133,762,883	130,042,098	132,880,724	137,456,126
Other undivided profits.....	19,845,228	22,774,766	25,815,395	27,448,960	26,017,047
Dividends unpaid.....	44,696	123,298	19,364	41,412	160,297
Individual deposits (savings).....	1,425,230,349	1,524,844,506	1,623,079,749	1,712,769,026	1,785,150,957
Individual deposits (not savings)...	19,160,976	25,179,450	31,746,393	45,560,592	23,649,305
Due to other banks and bankers..	992,323	1,996,161	2,766,225	3,593,717	2,350,368
Other liabilities.....	6,801,262	7,534,902	8,941,718	4,342,955	5,561,859
Total.....	\$1,622,612,215	\$1,742,617,001	\$1,854,517,069	\$1,964,044,861	\$2,013,775,147

TABLE SHOWING BY STATES THE AGGREGATE SAVINGS DEPOSITS OF SAVINGS-BANKS, WITH THE NUMBER OF THE DEPOSITORS AND THE AVERAGE AMOUNT DUE TO EACH IN 1891-92 AND 1892-93.

STATES.	1891-92.			1892-93.		
	Number of Depositors.	Amount of Deposits.	Average to each Depositor.	Number of Depositors.	Amount of Deposits.	Average to each Depositor.
Maine.....	146,668	\$50,278,452	\$342.80	155,933	\$53,397,950	\$343.76
New Hampshire.....	169,949	72,439,000	426.34	174,654	74,377,279	425.85
Vermont.....	80,740	34,674,742	305.60	89,115	27,262,990	305.93
Massachusetts.....	1,131,203	369,526,386	326.67	1,189,936	393,019,862	330.29
Rhode Island.....	136,648	66,276,157	485.01	142,492	69,906,993	490.60
Connecticut.....	317,925	122,582,100	385.57	351,061	130,686,729	394.75
New York.....	1,516,289	588,425,421	388.07	1,593,804	629,358,274	394.88
New Jersey.....	131,739	33,807,634	256.62	140,772	36,488,246	259.20
Pennsylvania.....	248,471	65,233,993	262.54	252,980	66,417,794	262.54
Delaware.....	17,318	3,626,319	209.39	18,613	3,739,454	200.90
Maryland.....	142,135	41,977,868	295.34	147,462	44,495,128	301.74
District of Columbia.....	1,303	60,178	46.18	1,400	74,729	53.38
West Virginia.....	8,428	473,848	56.22	*5,149	237,707	46.16
North Carolina.....	6,247	282,425	45.21	6,112	301,234	49.28
South Carolina.....	21,397	4,225,459	197.48	24,422	5,913,139	242.12
Georgia.....	4,569	572,523	125.30	*8,494	1,004,765	118.29
Florida.....	170	31,912	187.73	*1,321	219,448	166.12
Alabama.....	1,698	220,046	129.59	1,848	73,032	39.32
Louisiana.....	5,557	1,695,732	305.15	6,507	2,003,854	307.95
Texas.....	1,950	279,783	143.48	2,583	356,553	138.04
Arkansas.....	258	51,854	200.10	844	123,451	146.27
Tennessee.....	*16,392	1,292,913	78.87	*14,126	1,778,174	125.88
Ohio.....	84,779	33,895,078	399.80	85,614	34,606,213	404.21
Indiana.....	15,418	3,754,622	243.52	16,127	4,073,131	252.56
Illinois.....	*73,872	21,106,369	285.72	*84,861	23,498,504	276.90
Michigan.....	180,391	36,959,573	204.88	.....	.....	.....
Wisconsin.....	948	138,926	146.59	1,164	184,698	158.67
Iowa.....	*71,687	26,115,384	364.29	*73,108	26,426,031	361.46
Minnesota.....	35,123	8,786,879	250.17	42,212	10,658,564	252.50
Oregon.....	.....	.....	.....	*2,461	683,620	277.78
Colorado.....	*21,215	2,893,276	136.38	*11,639	2,217,547	190.52
Utah.....	*13,596	2,427,950	178.58	22,815	2,935,849	128.68
Montana.....	.....	.....	.....	1,736	423,248	243.80
New Mexico.....	900	149,449	166.05	885	186,923	211.21
Washington.....	*8,955	1,193,967	133.33	.....	.....	.....
California.....	*167,667	127,312,088	759.32	*178,949	138,019,874	771.28
Total.....	4,781,605	\$1,712,769,026	\$358.20	4,890,599	\$1,785,150,957	\$369.55

SAVOIR-FAIRE (Fr., "to know [how] to act") denotes "skill," "tact;" "the power of contriving and executing successfully;" "To have one's wits about one." *Il vit de son savoir-faire*, "He lives by his wits."

SAVOIR-VIVRE (Fr., "to know [how] to live," denotes "good breeding;" "good manners;" *Avoir du savoir-vivre*, "to be well-bred."

SAVONA, a maritime city of northern Italy, in the province of Genoa, and 22 m. s.w. of the city of that name. It is situated on a plain near the sea, and has numerous manufactures, including extensive potteries. The neighborhood produces olives, fruits, grain, wood, and wines. It carries on a brisk trade with Marseilles. There are manufactures of machinery, cloth, fire-arms, pottery, chemicals, and iron and steel foundries. The harbor, one of the safest in the Mediterranean, was 25 to 30 ft. deep, till the Genoese in the 16th c. filled it with stones; but since the opening of the Mont Cenis tunnel, which promises to increase the commerce of Savona, steps have been taken to have it cleared out. Pop. '81, 24,481. It is a very ancient city, and in the time of the Romans was called Sava, founded, according to tradition, by Janus. It flourished under the Roman empire, was destroyed by Rotharis (639), was rebuilt by Ludovic the Pious (981), and was afterward laid waste by the Saracens.

SAVONAROLA, GIROLAMO, the celebrated preacher and political as well as religious reformer of Florence, was b. of a noble family at Ferrara, September 21, 1452. He was educated at home, and, at a very early age, became deeply versed both in the philosophy of the schools and in the old Greek philosophy, which at that time had become popular in Italy; but his disposition from the first was strongly tinged with religious asceticism, and, in 1475, he formally withdrew from secular affairs, and entered the Dominican order at Bologna. Having completed his novitiate and the studies of the order, his first public appearance as a preacher seems to have been in 1482 at Florence, where he had entered the celebrated convent of his order, San Marco, and where he preached the Lent in that year. His first trial, however, was a signal failure. His voice was harsh and unmusical, and he so utterly failed to interest his hearers, that, after a time, the course of lectures was entirely deserted. Some time afterward Savonarola was sent to a convent of his order

at Brescia, where, by degrees, his earnestness and zeal began to attract notice, and eventually, the disadvantages of manner and address, which had told against the effect of his early efforts, either were overcome through practice, or ceased to be felt under the influence of his sterling genius and irresistible enthusiasm. In 1490 he was once more recalled to the convent of San Marco at Florence. His second appearance in the pulpit of San Marco was a complete success. The great subject of his declamation was the sinfulness and apostasy of the time; and in his denunciation of the vices and crimes of his age, he took as his theme what has been the topic of enthusiasts in almost every age, the mystical visions of the apocalypse, which he applied with terrible directness to the actual evils with which, as with a moral deluge, the age was inundated; and in these half-expositions, half-prophetical outpourings, his followers claimed for him the character of an inspired prophet. Under the rule of the great founder of the family of the Medici, Lorenzo the Magnificent, art, literature, and philosophy, had all followed the common direction of that elegant but semi-pagan revival, which the scholars of the 15th c. had inaugurated; and the whole spirit of the social as well as intellectual movement of which Florence, under the Medici, was the center, was utterly at variance with the lofty Christian spirituality and severe asceticism in which Savonarola placed the very first conditions of the restoration of true religion and morality. His preaching, therefore, in its spirit, as well as in its direct allusions, was no less antagonistic to the established system of the government, than to the worldly and irreligious manners of the age; the visions and predictions ascribed to him had quite as much of political applicability as of religious significance; and thus, to the aristocratic adherents of the Medici, Savonarola early became an object of suspicion, if not of antipathy and dread. It is said by Pico de Mirandola, that he refused to grant absolution to Lorenzo, when the latter lay dying in 1492; but the statement does not accord with Poliziano's account of his patron's death. Through all this time, however, Savonarola's relations with the church were, if not of harmony, at least not of antagonism; and when, in the year 1493, a reform of the Dominican order in Tuscany was proposed under his auspices, it was approved by the pope, and Savonarola was named the first general vicar. About this time, however, his preaching had assumed a directly political character, and the predictions and denunciations which formed the staple of many of his discourses, pointed plainly to a political revolution in Florence and in Italy, as the divinely ordained means for the regeneration of religion and morality. In one of his discourses he pointed plainly to the advent of the French under Charles VIII.; and when this prediction was fulfilled by the triumphant appearance of the French expedition, Savonarola was one of a deputation of Florentines to welcome Charles VIII. as the savior of Italy, and to invite him to Florence. Very soon, however, the French were compelled to leave Florence, and a republic was established, of which Savonarola became, although without political functions, the guiding and animating spirit, his party, who were popularly called *Pragnoni*, or "Weepers," from the penitential character which they professed, being completely in the ascendant. It was during this brief tenure of influence that Savonarola displayed to the fullest extent, both the extraordinary powers of his genius, and the full extravagance of the theories to which his enthusiastic asceticism impelled him. The republic of Florence was to be the model of a Christian commonwealth, of which God himself was the chief ruler, and his gospel the sovereign law; and thus the most stringent enactments were made for the repression of vice, and of all the sinful follies by which it is fomented and maintained. All the haunts of debauchery were suppressed; gambling in all its forms was prohibited; the vanities of dress were restrained by sumptuary enactments; and, under the impulse of the popular enthusiasm which the enthusiasm of the prophet engendered, women flocked in troops to the public square to fling down their costliest ornaments; and gay gallants and grave scholars destroyed, in one common *auto da fé* before the gates of the cathedral, whole hecatombs of the amatory poetry or licentious fiction of the day, in conjunction with the elegant paganism or unconcealed immorality of the classic period. Meanwhile, the extremes of his rigorism; the violence of his denunciations, which did not spare even the pope himself; the assumption by him, or attribution to him, of a supernatural gift of prophecy; and the extravagant interpretation of the Scripture, and especially of the apocalypse, by which he sought to maintain his views, drew upon him the displeasure of Rome. He was cited, in the year 1495, to answer a charge of heresy at Rome; and on his failing to appear, he was forbidden to preach; the brief by which the Florentine branch of his order had been made independent was revoked, and he was again summoned to Rome. Once again Savonarola disregarded this order. But his domestic difficulties now began to deepen. The measures of the new republic proved impracticable. The party of the Medici, called "Arrabbiati" (enraged), began to recover ground. A conspiracy for the recall of the exiled house was formed; and although for the time it failed of success, and six of the conspirators were condemned and executed, yet this very rigor served to hasten the reaction. The execution of these conspirators was a direct violation of one of Savonarola's own laws, and it tended to direct the popular sympathy in their favor. At the critical point of the struggle of parties came, in 1497, a sentence of excommunication from Rome against Savonarola. Savonarola openly declared the censure invalid, because unjust, and refused to hold himself bound by it. In the following year, however, 1498, when the new elections took place, the party opposed to Savonarola, the Arrabbiati

came into power. He was ordered to desist from preaching, and the struggle was brought to a crisis by the counter-denunciations of a preacher of the Franciscan order, long an antagonist of Savonarola, Francesco da Puglia. In the excited state of the popular mind thus produced, an appeal was made by both of the contending parties to the interposition of divine providence by the ordeal of fire. But at the moment when the trial was to have come off, difficulties were originated by the party of Savonarola, and nothing was actually done. The result of this was to destroy with the populace the prestige of Savonarola's reputation, and to produce a complete revulsion of public feeling. In the midst of this reaction he was cited before the council, and brought to trial for misleading the people by false prophecies. He denied the charge; but being threatened with torture he is said to have made a confession, which, however, his friends say was garbled, if not utterly falsified. He was declared guilty of heresy and of seditious teaching. The acts of the trial were sent to Rome, where the sentence was confirmed, and he with two others of his order were given up to the secular power. An effort was made to procure a remission of the capital sentence which was passed upon them, but in vain; and on May 23, 1498, this extraordinary man, with his two companions, F. Domenico da Pescia and Silvestro Maruffi, were executed, and their bodies burned by the executioner. They died professing their adherence to the Catholic church, and humbly accepting the last absolution from the papal commissary; and it is still a question among Catholics whether Savonarola is to be regarded in the light of a confessor of the truth, or of a fanatical forerunner of the movement which so soon reached its full development in the reformation. The works of Savonarola are very numerous. They were all written either in Latin or in Italian, but have for the most part been translated into French, German, Spanish, and other languages. His works in Latin are: (1) *On the Simplicity of the Human Soul*; (2) *The Triumph of the Cross*; (3) *A Dialogue of the Spirit and the Soul*; (4) *A Fourfold Exposition of the Lord's Prayer*; (5) *On the Perfection of the Spiritual Life*. Most of them were translated contemporaneously into Italian, and some even by Savonarola himself. His principal Italian works are: *A Treatise on Humility*; *On the Love of Jesus Christ*; *On the State of Widowhood*; *Two Treatises on Prayer*; *Rules of Christian Living* (together with a work of a title almost the same which he wrote while in prison, and at the desire of his jailer); *On the Mysteries of the Mass*; and several other doctrinal and ascetical treatises. No collected edition of his sermons has been published, and his correspondence also has, for the most part, disappeared; but the works which survive sufficiently illustrate the peculiarities of his genius, and the stern and almost fierce enthusiasm which was the secret of his influence on that corrupted but yet cultivated age.—See Madden's *Life of Savonarola* (2 vols. 8vo, 1854); Abbé Carle's *Histoire de S.* (Paris, 1842); Revere's *I Piagnoni e gli Arrabbiati al Tempo di S.* (2 vols. Milan, 1843); Clark, S., *his Life and Times* (London, 1878); Villari's *Storia di G. Savonarola e de' Suoi Tempi* (Florence 1887); Hase, *Neue Propheten* (1893).

SAVONETTES, soap of fine quality, perfumed and made into balls or other shapes for use at the toilet.

SA VORY, *Satureja*, a genus of plants of the natural order *labiate*, nearly allied to thyme (*thymus*), and differing from it in the regularly 5-toothed or 5-cleft calyx, and the stamens bent together into an arch under the upper lip of the corolla. The species are herbaceous and half-shrubby plants, all natives of the south of Europe and the east. They have narrow, linear-lanceolate, entire leaves, with resinous dots, and short, axillary, little corymbs. The COMMON SAVORY, or SUMMER SAVORY (*S. hortensis*), is commonly cultivated in kitchen gardens for flavoring dishes. It is an annual plant $\frac{1}{2}$ to 1 ft. high, with leaves not prickly pointed, and lilac or white flowers; has a strong and agreeable aromatic smell, and an aromatic pungent taste, and is in common use both fresh and dried for flavoring dishes, and especially for flavoring beans. It is stomachic and tonic.—WINTER SAVORY (*S. montana*) is used exactly in the same way. It is a half-shrubby plant, with prickly-pointed leaves and larger flowers. Its taste is pungently aromatic.—Summer savory is propagated by seed; winter savory by slips and cuttings.

SAVOY, a cultivated variety of cabbage (q.v.), forming a large close head like the true cabbages, but having wrinkled leaves. A number of sub-varieties are in cultivation. The mode of cultivation and the uses are the same as those of cabbage. Savoyes are much cultivated for winter use; they require a light rich soil.

SAVOY, formerly a duchy belonging to the kingdom of Sardinia (q.v.), now incorporated with France, is bounded on the n. and e. by Switzerland, e. and s. by Piedmont, and w. by the French departments of Isère and Ain. While an Italian duchy it was politically divided into seven provinces, a division which exhibited the successive steps of its acquisition by the house of Savoy; but since its annexation to France this division has been modified, though the change has been little more than nominal. It is now separated into two departments: first, SAVOIE, or CHAMBERY, the southern part of Savoy, with an area of 2224 sq. m., and a pop. of (1896) 259,790, which is divided into four arrondissements—Chambery (old province of *Chambéry*), Albertville (*Alto-Savoia*), Moutiers (*Tarantasia*), and Saint Jean de Maurienne (*Maurienne*)—and has Chambery for its capital; secondly, HAUTE-SAVOIE, or CONFLANS, the northern part of Savoy, which

has an area of 1667 sq. m., with a pop. of (1896) 265,872, and is divided into four arrondissements—Bonneville (*Fossigny* or *Faucigny*), Thonon (*Ciablèse* or *Chablais*), Annecy and St. Julien (*Genevese*)—Annecy being the capital. The two departments resemble each other so much in all respects that they may be described together.

Savoy is the most elevated tract in Europe, and is mostly covered with mountains, which break up the country into a number of valleys, each watered by its own snow-fed torrent or stream. The highest elevation of Savoy is the summit of Mont Blanc (q.v.), and the lowest is the bank of the Rhone at Saint-Genix d'Aosta, 670 ft. above sea level. The Graian Alps run along the eastern boundary of Savoy, and form a natural barrier between it and Piedmont, several breaks or gorges affording means of communication between the two countries; from this range the mountains gradually decrease in height toward the valley of the Rhone, which is on the western boundary.

Savoy (especially Haute-Savoie) is extremely picturesque, and within a comparatively limited space exhibits at once the curious, the beautiful, the grand, and the wild and forbidding phases of natural scenery. There we have the lakes of Geneva, Annecy (9 m. by 1½), Aiguebellette, each perfect in its own style of beauty; the subterranean lakes of Bauge, the cascades of Sallanches and Bout-du-monde, the intermittent springs of Pigros and Haute-Combe, the grottoes of Balme, Bauge, and Sallanches, the hot springs of Aix-le-bains (near Chambéry), of Saint Gervais, Bride, Echaillon, and others; the smiling valleys of Chambéry, Faverge, Maglan, and Albertville; the glaciers of Chamounix, Buet, and upper Tarantasia; the wooded mountain-sides of Ciablèse, the bare rugged peaks which surround Mont Blanc, the frowning gorge of Challes, and the wild and savage glens and dells of Maurienne. Tourists consequently flock in great numbers to Savoy, the robust to gratify their love of sight-seeing, and the invalids to benefit by the thermal springs, which are much esteemed.

The whole of the country is drained by streams which flow either into lake Lemman (the northern boundary) or the Rhone. Chief of the former is the Drance, which traverses Chablais; among the latter are the Arve, which drains the Chamounix valley, the Usse, the Fier, the Laisse, the Guier, and the Isère. The geology of Savoy is marked by the presence of three distinct ranges, exhibiting respectively the primary, transition, and secondary series of rocks with great completeness; and the depth of the crevasses, the height of the mountains, inversions of strata, débris on the mountain-sides, afford excellent opportunities for a thorough study of the constitution and elements of the earth's crust.

The whole of Savoy is broken up into a multitude of small estates, and the country is as a consequence most carefully cultivated, some of the fertile valleys resembling a continuous garden abounding in flowers and fruits. The ground suitable for cultivation being very limited, the enterprising natives have made extraordinary efforts to increase it by constructing line above line of parapets along the steep mountain-sides, and by filling in earth behind, forming long and narrow terraces, on which, if they can succeed in growing two rows of vines, they consider themselves well rewarded for their labor. These terraces are most common in the hilly districts of Tarantasia and Maurienne.

The climate of Savoy is in general cold, the winters are long and severe, and the summers frequently follow without an intermediate spring. Yet Savoy can boast of the vegetation of warm countries, as well as of that of higher latitudes; the vine is found growing almost to the edges of the glaciers, and cereals and fruits of various sorts are produced in great perfection. The pasturage is rich and abundant, and mulberry trees are largely planted. Although it is essentially an agricultural country, the industrial arts are not unrepresented; fabrics of cotton, tobacco, and gauze, stockings, felt hats, woolen cloth, are manufactured in various localities; and tanneries, breweries, distilleries, glass-works, potteries, etc., are occasionally met with. The chief occupation, however, is the breeding of cattle, horses, and mules, all of which are much esteemed, and fetch good prices; and bees and silkworms are tended as a source both of amusement and profit.

Savoy is rich in minerals—silver, iron, copper, antimony, manganese, lead, zinc, asphalt, marble, granite, gypsum, sulphur, and salt. The principal mines are the spathic iron mine of Saint Georges d'Hurtières, and the lead mine of Macot. Coal is found in Maurienne.

The exports consist of the surplusage of these products, and also of cheese, hemp, silk, both raw and spun, and wood of various sorts. In Savoy much attention is paid to education, a great many of the colleges, as well as the schools, offering free tuition.

The Savoyards are honest, intelligent, religious, hospitable, and enthusiastically patriotic, even to a greater extent than the Swiss. A large number of them expatriate themselves annually for the purpose of pursuing various callings, but the greater portion return early in summer, while others wait till they have amassed wealth sufficient for the rest of their lives.

SAVOY, HOUSE OF. The small territory of Savoy formed a part of ancient Gaul, and after the decline of the Roman power was seized by the Burgundians (407 A.D.), and along with Burgundy passed under the Franks (534). On the breaking up of the Frankish empire, Savoy was joined to *Transjurane Burgundy*, and along with that king-

dom was united to *Cisjurane Burgundy*, or Arles. On the accession of the last king of Arles to the imperial throne as Conrad II., the great lords of north-western Italy, such as the lords of Suza, Chablais, Maurienne, and Turin, became vassals direct of the empire. The counts of Maurienne, the ancestors of the house of Savoy, are generally believed by most historians who have investigated their genealogy to have descended directly in the male line from a son of Wittekind the great, the last independent king of the Saxons; and COUNT HUMBERT, *the white-handed*, was the first of the family who, by the addition of Chablais and Valais (grants from the emperor Conrad the Salic) to his hereditary lordship of Maurienne, rose to high position among the princes of northern Italy. One of his descendants, HUMBERT II. (1078-1103), succeeded to the marquisate of Suza (which included the greater part of Piedmont), and further increased his little territory by the conquest of Tarantasia. The family now commenced to form alliances with the royal houses of France, Portugal, England, Naples, Spain, and Germany, which added greatly to its political importance. AMADEUS III. (1103-49) received from the emperor Henry V. the title of COUNT OF SAVOY (1111), and his grandson, THOMAS I. (1188-1233), obtained important accessions in Chambéry, Turin, the country of Vaud, and many other lordships. Count Thomas was the initiator of the policy so long and successfully adopted by his successors, "of preserving armed neutrality in all contests between France and the empire, and of vigorously supporting the empire against the papacy." From this time the counts of Savoy became the arbiters of all quarrels in north, and occasionally in south Italy, and their bravery in the field and keen political sagacity* increased at once their political influence and their territorial jurisdiction. After the death of count Boniface, in 1263, without heirs, his uncle, PIETRO, the earl of Richmond and lord of Essex, usurped the crown; but in 1285 the rightful heir, AMADEUS V. (1285-1323), the grandson of Pietro's elder brother, obtained the succession; and his grant to his brother THOMAS of the principality of Piedmont as a hereditary fief, founded the two lines of Savoy and Piedmont, which continued to rule over their respective territories till, on the latter becoming extinct in 1418, Piedmont reverted to the elder line. (See AMADEUS V., VI., and VIII.) Amadeus VIII. was the first DUKE OF SAVOY, being so created by the emperor Sigismund in 1416. CHARLES I. (1482-89) obtained from Charlotte of Lusignan, queen of Cyprus, the transference of her rights, and from this date (1485) the dukes of Savoy also claimed to be kings of Cyprus and Jerusalem. The elder male line becoming extinct in 1496, the next collateral heirs were PHILIBERT II. (1496-1504) and CHARLES III. (1504-53); but the latter, having sided with Charles V. against Francis I. of France, was deprived of the duchy of Savoy in 1533, the countries of Valais and Geneva placed themselves under the protection of Switzerland, and in 1536 the country of Vaud was seized by the people of Bern. But his son, PHILIBERT EMMANUEL, who was the Spanish governor in the Netherlands, succeeded, at the peace of Cateau-Cambresis (1559), in obtaining repossession of Savoy. He attempted to convert the Vaudois (see WALDENSES), and founded the now, important silk-production in Piedmont, besides, to the utmost of his power, encouraging the prosecution and development of other branches of industry. He reannexed (1576) the principality of Oneille, and conquered the county of Tende. His successor, CHARLES EMMANUEL I. (1580-1630), was celebrated as a scholar, statesman, and warrior, but he was cursed with an inordinate ambition, which involved him in unfortunate contests with Geneva (a former town of Savoy, of which he wished to regain possession), with the French, who in revenge took possession of his dominions, and with the Spaniards. His two sons, VICTOR AMADEUS I. (q.v.) (1630-37) and Thomas, were the respective founders of the two lines of Savoy and Savoy-Carignan. Victor Amadeus speedily regained the dominions which his father had lost; and with the consent of France added to them Montferrat, Alba, and some other places, relinquishing Pignerol, La Perouse, Angrone, and Lucerne to the French. As generalissimo of the French army in Italy, he gained two victories over the Spaniards, but died soon after. His grandson, VICTOR AMADEUS II. (1675-1730), was one of the claimants for the Spanish throne on the extinction of the Spanish-Hapsburg dynasty (see SUCCESSION, WAR OF THE SPANISH); and by his adroit policy in the contest between the Hapsburgs and Bourbons for the possession of this crown, he succeeded in obtaining extensive additions to his little territory, the chief of these being Alessandria, Val-di-Sesia, and other portions of the Milanese, the island of Sicily, in 1713, and along with this latter the title of king. He and his descendants were also recognized as the legitimate heirs of the Spanish throne, should the Bourbon dynasty ever become extinct. But in 1720 he was compelled to surrender Sicily to Austria, in exchange for the island of Sardinia, which, along with Savoy, Piedmont, and his other continental possessions, was then erected into the Kingdom of Sardinia, (q.v.)

SAVOY, THE, on the Thames, in London, is the site where once stood the magnificent palace, built in 1245 by Peter, earl of Savoy and Richmond. A century later it became the property of John of Gaunt, duke of Lancaster. In this building the French king Jean was royally imprisoned, from his capture in the battle of Poitiers to his death in 1364. The palace was twice the object of popular violence. In the outbreak caused

* It is a remarkable fact, in connection with the history of this family, that they have numbered among them more great warriors and politicians than any other royal house of Europe.

by the duke of Lancaster protecting Wycliffe it narrowly escaped destruction; and in Wat Tyler's insurrection it was burned and made a heap of ruins. After another hundred years Henry VII., great-grandson of John of Gaunt, erected on these ruins a house for the temporary support of destitute, diseased, helpless, and homeless persons. This well-intended charity soon became a refuge for the dissolute and vicious, rather than for the worthy poor. It was therefore suppressed by Edward VI., but was restored by queen Mary, and profusely refurnished by the ladies of her court from their private resources. In the management of this establishment great abuses prevailed. Its officials embezzled the fund, and the inmates continued to come from the degraded and criminal classes. The combined hospital and poor-house maintained a nominal existence through successive reigns, a portion of the buildings being occupied by Charles II. as a home for disabled soldiers and sailors, and was finally discontinued by queen Anne. In building the Waterloo bridge in 1810, the deep foundations on which the ancient buildings had rested were all removed. Nothing remained but the chapel built alongside these ruins by Henry VII. This chapel was made a church by queen Elizabeth, and was one of the chapels royal, under the name of St. Mary-le-Savoy. It was burned down in 1864, but was rebuilt, though without aisles or chancel, and elegantly furnished for public worship by queen Victoria. The vaults beneath contain the remains of many persons of distinction.

SAVOY CONFERENCE, the name given to an ecclesiastical conference held in 1661 at the Savoy palace (so called because built in 1245 by Peter, earl of Savoy and Richmond [see AMADEUS]; burned by Wat Tyler in 1381, it was rebuilt and endowed in 1505 as an hospital for poor persons) between the Episcopalian and Presbyterian divines, with the view of ascertaining what concessions would satisfy the latter, and thereby lead to "a perfect and entire unity and uniformity throughout the nation." During the rule of the protector Cromwell the church of England had been in a very anomalous condition. Most of the clergy who held office during the early period of the civil wars were strong royalists, and either were ejected or fled when the cause of the parliament triumphed. Their places had been supplied in many cases by zealous Presbyterians—a rather numerous body in England at that time, and thus it happened at the restoration of Charles II. that a considerable section of the ministers *within the church* were hostile to the reintroduction of Episcopalian order and practice. Aware of this feeling, yet desirous of not adopting severe measures, if such could possibly be avoided, the king issued letters-patent dated Mar. 25, appointing twelve bishops, with nine clergymen as assistants on the side of the Episcopal church, with an equal number of Presbyterian divines, "to advise upon and review the *Book of Common Prayer*." Among the Episcopalian commissioners were Frewen, archbishop of York, Sheldon, bishop of London, Gauden of Exeter, Reynolds of Norwich, etc.; among their assistants, Dr. Peter Heylin, Dr. John Pearson, and Dr. Thomas Pierce. The most notable representatives of the Presbyterian party were Richard Baxter, Dr. John Wallis (then Savilian professor of geometry at Oxford), Edmund Calamy, William Spurstow, and Matthew Newcomen. The conference (which lasted four months) was opened on April 13. The Presbyterians (according to Burnett) demanded that archbishop Usher's scheme of a "reduced Episcopacy," in which the elements of the Scotch system of presbyteries, synods, and general assemblies were combined with distinctions of ecclesiastical ranks, should be made the basis to begin with; that responses should be given up; that the prayers in the litany should be combined into one; that no lessons should be taken out of the Apocrypha; that the psalms read in the daily service should be according to the new translation; that the term regeneration (among others) should be struck out of the baptismal service; and that the use of the surplice, of the cross in baptism, of godfathers as sponsors, and of the holy days, should be abolished. They were told in reply that the commission had no authority to discuss questions affecting the government of the church, such as were contained in archbishop Usher's scheme; whereupon they proceeded to consider the minor points, such as the alterations of the liturgy. Baxter, with the consent of his party, drew up a "reformed liturgy" which the Episcopalian commissioners would not look at, considering the wholesale rejection of the older one *ultra vires* on their part. Finally, the parties separated without arriving at any conclusion; and this fruitless attempt at "comprehension" was followed in 1662 by the famous "act of uniformity," the result of which was that 2,000 clergymen were forced to abandon their livings in the church of England.

SAVOY CONFESSION, named from the hospital building in the Strand, London, in which it was drawn up—a document adopted by an assembly of Congregational ministers, who, by Cromwell's permission, unwillingly given just before his death, met in the Savoy palace, Sept., 1658, to declare the principles of their faith and polity. The doctrinal part agrees in substance and almost verbally with the Westminster confession. Its outline of church polity, however, is in its principles Congregational, though not entirely accordant with modern Congregational usage. It contains the following propositions: 1. A particular church consists of officers and members, the Lord Christ having given his followers—united in church order—liberty and power to choose persons fitted by the Holy Ghost to be over them in the Lord. 2. The officers appointed by Christ are pastors, teachers, elders, and deacons. 3. The way appointed by Christ for calling persons to these offices is that they be chosen thereunto by the common suffrage of the church

itself, and set apart by fasting and prayer, with the imposition of hands of the elder ship of that church; and those who are so chosen, though not set apart after that manner, are rightly constituted ministers of Jesus. 4. The work of preaching is not so confined to pastors and teachers but that others also, gifted and fitted by the Holy Ghost and approved by the people, may perform it. 5. Ordination alone, without election or consent of the church, doth not constitute a person a church officer. 6. A church furnished with officers, according to the mind of Christ, hath power to administer all his ordinances, even where for a time some of the offices are not filled; but where there are no teaching officers the church cannot authorize any persons to administer the seals. 6. Every church hath power to execute all the censures appointed by Christ as a means of edification, on those who do not walk according to his laws. These censures are admonition and excommunication; and as some offenses may be known only to some members, those members must first admonish the offender in private; in public offenses, and in cases of non-amendment on private admonition, the offense being related to the church, the offender is to be admonished in the name of Christ by the whole church, through the elders; and if he do not repent, then he is to be excommunicated with the consent of the members. See SAVOY CONFERENCE.

SAVU' ISLANDS, THE, lie in the Indian Ocean. Pop, 35,000. They are small except Savu, in 121°45' to 122°7' e, long, and 10°25' to 10°36' s. lat.; area 237 sq. miles. The islands are under the Dutch government. It is healthy and moderately fertile, the thermometer ranging from 76° to 88° Fahr. by day, and 68° to 70° by night. The products are those of the archipelago, including tobacco and horses, but ships from Timor no longer call for horses. There is good anchorage at Seba. The Savunese are of the Malay race—brave, and feared by their neighbors. Their religion is a traditional heathenism, in which the offering of sacrifices of dogs is frequently practiced. Also called Savau, Savoie, etc.

SAW, one of the most important tools used in working timber. It usually consists of a long strip of thin steel, with one edge cut into a continuous series of sharp teeth. Notwithstanding the great simplicity of the principle upon which the saw is made, it admits of great variation, and modern carpentry has brought into use a great many kinds of saws adapted to different purposes. The two chief classifications into which saws may be divided, are cross-cut saws and rip-saws. In the former, the teeth, which are of a special shape, are designed to cut at right angles to the fiber of the wood, while in the latter they are adapted to cutting in the direction of the fiber. The most common is the *hand-saw* in general use. For this the blade is broader at one end than the other, and a wooden handle is fixed to the broader end, without which it could not be used. The *bow-saw* is used for a variety of purposes; the blade, which is always thin, is stretched like a bowstring to an iron frame. The *frame-saw*, chiefly used in sawpits and mills for cutting timber longitudinally, is similar in shape to the ordinary hand-saw, but much larger, with holes at each end, for fixing it in the frame by which it is moved up and down. For cutting timber transversely, the *cross-cut saw* is used; this differs not only in shape, but in the set of the teeth from other saws. Within the present century, the *circular-saw* has come into universal use wherever machinery can be had for working it. It is generally so fitted as to be worked under a flat bench, a part only of the blade projecting through a narrow slit cut in the top of the bench. It is made to revolve with great rapidity, and the wood resting on the bench is pushed against the saw in the direction it is intended to be cut. The rapidity with which wood is cut by the circular-saw is truly marvelous. The *band-saw* was invented in 1808. It consists of a very long band—or web, as it is called—of steel, usually very narrow, and with finely cut teeth. The two ends are joined together so as to form an endless band, which is passed over two revolving drums, one above and the other below the working-bench, through holes in which the saw passes. The *cylinder-saw* is another variety, which was an invention of great antiquity. They are used for cutting curved staves for barrels, button blanks, sheaves, and other special forms. Numerous other kinds of saws are in use, but these are the chief.

SAWDUST. The waste made by sawing timber, formerly of little or no use, has now become a material of some value in localities where it can be applied. Its most interesting application is one very recently patented by Messrs. Dale & Co. of Manchester, whereby it is converted into oxalic acid, and with so much success as to have nearly or altogether displaced every other method of making that chemical. The process is very simple. The sawdust is first saturated with a concentrated solution of soda and potash in the proportion of two of the former to one of the latter; it is then placed in shallow iron pans, under which flues run from a furnace, whereby the iron pans are made hot, and the saturated sawdust runs into a semi-fluid pasty state. It is stirred about actively with rakes, so as to bring it all in contact with the heated surface of the iron, and to granulate it for the succeeding operations. It is next placed in similar pans, only slightly heated, by which it is dried. In this state it is oxalate of soda mixed with potash. It is then placed on the bed of a filter, and a solution of soda is allowed to percolate through it, which carries with it all the potash, leaving it tolerably pure oxalate of soda. It is then transferred to a tank, in which it is mingled with a thin milk of lime, by which it

is decomposed, the lime combining with the acid to form oxalate of lime, and the soda being set free. Lastly, the oxalate of lime is put into a leaden cistern, and sulphuric acid is poured in; this takes up the lime, and sets free the oxalic acid, which readily crystallizes on the sides of the leaden cistern, or on pieces of wood placed on purpose. So rapid and cheap is this method, compared with that formerly in use, that several extensive manufactories for making oxalic acid in the old manner have been shut up, being unable to compete with the patent process.

Another interesting use of the sawdust of hard woods, such as rosewood, ebony, etc., is that recently made known in France under the name of *Boisdurci*. The various kinds of sawdust used are reduced to fine powder, and mixed with blood into a paste; other materials are doubtless added, for when pressed into molds it is jet black and receives the most beautiful impressions. Messrs. Lamy, Senior & Co. of Paris produce some very beautiful medallions and other small articles in this material.

SAW-FISH, *Pristis*, a genus of cartilaginous fishes, constituting the family *Pristidae*, which is ranked with the rays (q.v.), although the elongated form of the body agrees rather with that of the sharks. In a number of anatomical characters, however, the saw-fishes differ from sharks, and agree with rays, and conspicuously in the position of the gill-openings, which are not on the sides, as in sharks, but on the under surface, as in rays. The mouth is on the under surface of the head, and is furnished with pavement-like teeth, adapted for crushing. But the saw-fish is particularly remarkable for the elongation of the snout into a flat bony sword, armed on each edge with about twenty large bony spines or teeth; a most formidable weapon, of which it seems to make use for killing prey, rushing among shoals of fishes, and slaying them right and left. Whales are said to be sometimes killed by saw-fishes, and the saw has been sometimes driven into the hull of a ship. There are six or seven known species of saw-fish, and they are distributed over the whole world. The COMMON SAW-FISH (*P. antiqorum*) was known to the ancients, being found in the Mediterranean. It is a very widely distributed fish, being found both in polar and tropical seas. It sometimes attains the length of eighteen feet, including the saw. Saw-fishes are seldom seen near the shore, and no species is reckoned among American fishes.

SAW-FLY, *Tenthredo*, a Linnæan genus of insects of the order *hymenoptera*, now divided into many genera; and constituting a family of which the species are very numerous. They derive the name saw-fly from the ovipositor of the females, which is scaly, serrated, pointed, and inclosed in a sheath of two concave plates. By means of this instrument, the female saw-fly perforates the stalks or other parts of plants, laying an egg in each hole. The hole soon becomes filled with a frothy liquid, and sometimes a gall-like swelling is formed, within which the larva resides. The larvæ of many saw-flies, however, live in no such nests, but feed on foliage, like caterpillars, which they very much resemble. One of the most common species of gooseberry "caterpillar" is the larva of a saw-fly (*nematus ribesii*). Saw-flies have the abdomen cylindrical, and so united to the thorax that the distinction is not easily perceived. They vary much in the antennæ. Both pairs of wings are divided by nervures into numerous cells. Among the more notable species is the CORN SAW-FLY (*cephus pygmaeus*), which, in its perfect state, abounds on umbelliferous flowers, a shining black insect, marked with yellow, the abdomen elongated. The larva consumes the inside of the straw of corn, and descending to the base of the straw, cuts it down level with the ground.—Another important species is the TURNIP SAW-FLY (*athalia spinarum*), reddish, spotted with black; the larva nearly black, and known by the names of *Black Jack* and *Nigger*. The turnip saw-fly is sometimes very troublesome and destructive for a year or two and then almost completely disappears for a number of years.

SAWNEY. See NATIONAL NICKNAMES.

SAW-MILL. Within the present century, the art of working saws by machinery has been invented, and large mills for cutting up timber by means of large saws worked by machinery are to be found in most civilized countries. They are worked both by steam and water-power, and in Holland, wind-mills are made to work sawing machinery. The arrangements of a saw-mill are very simple; they consist of a fixed horizontal frame, with rollers at short intervals, upon which the tree or log of timber is laid; at the end of this, another frame is placed in a vertical position; it contains as many saws placed side by side as it is proposed to cut planks out of the log, and they are set as far apart as the desired thickness of the planks or boards. A rapid up and down motion is given to these saws by the machinery, and at the same time the log is pulled forward on the rollers by the same power, so as to be kept constantly up to the saws. In this way, a large tree or log of wood may be cut into twenty planks in much less time than was formerly required by laborious hand-labor to cut one single thickness.

The circular saw is now in general use in mills for cutting planks and boards into pieces of almost any size, but is very wasteful in converting timber into lumber. Band-saws have been found more economical and rapid.

SAWYER, a co. in n.w. Wis., formed 1888. Pop. '90, 1977. Area, 1368 sq. m. Co. seat, Hayward.

SAWYER, PHILETUS, b. Whiting, Vt., 1816. His parents removed to New York, 1817, where he received a common school education. He removed to Wisconsin, 1847, and was a member of the legislature of that state, 1857-61; was a repub. representative

to the XXXIXth and four succeeding congresses, and was elected to the U. S. senate, 1881, 1887.

SAWYER, THOMAS JEFFERSON, D.D., b. Vermont, 1804; graduated at Middlebury college in 1829; studied for the ministry, and in 1830 settled over a Universalist society in New York; became principal of the Liberal institute, Clinton, N. Y., in 1845, teaching also classes in theology; returned to his former charge in New York in 1852. He was one of the founders of Tufts college at Medford, Mass., where he was appointed professor of theology in 1869. He refused the presidency of Tufts college, of St. Lawrence university, N. Y., and Lombard university, Ill. He has published *Discussion of the Doctrine of Universal Salvation; Endless Punishment in the Very Words of its Advocates*, etc.

SAXE, HERMANN MAURICE, Count of, one of the greatest warriors of the 18th c., was the natural son of Augustus II. (q.v.), elector of Saxony and king of Poland, and the countess Aurora von Königsmark, and was born at Goslar, Oct. 28, 1696. When only twelve years of age, he ran off from home, made his way to Flanders, joined the army of Marlborough, and took part in the capture of Lille and the siege of Tournay. With a boyish love of change, he joined the Russo-Polish army before Stralsund (1711), and after the taking of Riga, returned to Dresden, where his mother induced him, in 1714, to espouse a young and amiable German heiress. In the two following years, he took part in the civil war then raging in Poland; but having quarreled with his father's favorite minister, he returned to Dresden, where the well-grounded jealousy of his wife made his life sufficiently disagreeable. Obtaining the annulment of his marriage, and a pension from his father, he came to Paris in 1720, where he devoted himself for some years to the study of military tactics, and originated and developed an entirely novel system of maneuvers, which was highly spoken of by the chevalier Folard, the celebrated military engineer. In 1726 he was elected duke of Courland, and for a time maintained himself in his new possession against both Russians and Poles, but was compelled to retire to France in the following year. Joining the army on the Rhine, under the duke of Berwick, he signalized himself at the siege of Philippsburg (1734), and decided the battle of Ettingen by a desperate charge at the head of a division of grenadiers. For these services he was made a lieutenant in 1736; and on the breaking out of the war of the Austrian succession, he obtained the command of the left wing of the army which was appointed to invade Bohemia, and took the strongly fortified town of Prague by storm with marvelous celerity. The capture of Eggra was similarly effected a few days afterward, and the rest of the campaign showed that his abilities in the field were not inferior to his skill against fortifications. In 1744 he was made a marshal of France, and appointed to command the French army in Flanders, and on this occasion he gave decisive proofs of the soundness and superiority of his new system of tactics, by reducing to inaction an enemy much superior in number, and taking from him, almost before his face, various important fortresses. The following year was for him more glorious still; his army was re-enforced, and though so ill with dropsy that he had to submit to tapping (April 15), he laid siege to Tournay on the 23d, and on the advance of the duke of Cumberland to its relief, took up a position at Fontenoy, and awaited attack. He was assailed on May 11, and the desperate valor of the English for a time bore down everything before them; but Saxe sped about on his litter, encouraging his troops, and when the critical moment came, the fire of his artillery disorganized the English, and a charge of the French completed the victory. Four months afterward every one of the numerous strong fortresses of Belgium was in his hands. In 1746 Saxe, by a series of able maneuvers, threw back the allies on the right bank of the Maese, and gained (Oct. 11) the brilliant victory of Raucoux, for which he was rewarded with the title of marshal-gen., an honor which only Turenne had previously obtained. For the third time, at Laufeldt (July 2, 1747), the victor of Culloden suffered complete defeat at the hands of Saxe, whose favorite system of tactics was again brought into full play; and the brilliant capture of Bergen-op-zoom brought the allies to think of peace. The Dutch, however, were still disposed to hold out, till the capture of Maestricht (1748) destroyed their hopes, and the peace of Aix-la-Chapelle followed. Saxe had previously carried on a correspondence with the great Frederick of Prussia, and he now took occasion to visit him at Berlin, experiencing the most brilliant reception. In the following year, Frederick wrote to Voltaire: "I have seen the hero of France, the Turenne of Louis XV.'s time. I have received much instruction from his discourse on the art of war. This general could teach all the generals in Europe." Saxe lived at his estate of Chambord for some time afterward, and died there of dropsy, Nov. 30, 1750. His work on the art of war, entitled *Mes Réveries*, was published at Paris in 1757.

Saxe was probably the greatest captain of his time, and a gallant and enterprising leader, but he was a mere soldier, and the offer of membership made to him by the Académie Française is sufficiently ridiculous. Saxe had, however, the good sense to decline the proffered honor, and he did so in a sentence, the extraordinary orthography of which accidentally rebuked, more than the most cutting sarcasm could have done, the mean sycophancy of the Académie. He wrote: "*Ils veulent me faire de la cadémie; cela m'irait come une bage a un chas.*"

Many biographies of Saxe have been written, but few of them are to be much depended upon.—See *Moritz von Sachsen* (Dresden, 1863), by Karl von Weber; and the

Nouvelle Biographie Générale (art. "Saxe"). His character and genius are also well, though not flatteringly, portrayed in Carlyle's *Life of Frederick the Great*.

SAXE, JOHN GODFREY, LL.D., b. Highgate, Vt., in 1816; graduate of Middlebury college, 1839; practiced law in Vermont, 1843-50. In 1850-56 he was editor of the *Burlington Sentinel*; state attorney, 1856. He was a contributor to the *Knickerbocker* magazine, and in 1846 published *Progress*, a satire, with other poems. His productions are marked with a ready and forcible wit. He read a poem on *The Times* before the Boston Mercantile Library association, and on *Literature and the Times* on the second anniversary of the New York free academy. In 1859 he published other poems; and new editions of his works appeared every alternate year till 1873. After 1860 he resided in Brooklyn and Albany, N. Y. He d. 1887.

SAXE-ALTENBURG, the smallest of the minor Saxon states, is a duchy bounded by Saxe-Weimar, Prussian Saxony, the kingdom of Saxony, Saxe-Meiningen and Schwarzburg-Rudolstadt, and separated into two nearly equal parts by the interposed principality of Reuss-Gera. The eastern portion, or *circle of Altenburg*, from its being watered by the Pleisse, was formerly called *Pleissengau*. It contains 243 English sq. m., with a pop. '95, of 127,255. The western part, or *circle of Saal-Eisenberg*, is watered by the Saale, with the Orla and Rode, and contains 257 English sq. m.; pop. '95, 53,058. Total area, 500 sq. m.; pop. '80, 155,036; '95, 180,313, nearly half of whom are inhabitants of towns. The vast bulk of the population are Protestants, there being, in 1895, 177,309 Protestants, 2,768 Catholics, 174 of other Christian sects, and 62 Jews. The eastern portion is open, undulating, and very fertile, and agriculture has here attained considerable perfection, and is diligently pursued by a large proportion of the population, so that much more corn is produced than is necessary for home consumption. The peasants in this circle, though speaking the Thuringian dialect, exhibit in their dress, manners, and customs a family resemblance to the Wendish-speaking Serbs of Lusatia; and numerous names of places, especially those ending in *itz*, indicate their Slavic origin. They are celebrated throughout Germany for their skill as agriculturists, and their superior intelligence, knowledge, and comparative wealth. The budget estimate of revenue for 1896-98 showed an annual revenue of 4,057,798 marks; and the expenditure 4,056,189 marks. The troops are, of course, under the command of the emperor of Germany. Saxe-Altenburg is a limited monarchy, in accordance with the constitution of April 29, 1831, modified somewhat by the events of 1848-49. By the law of 1870 the single chamber consists of 30 members, 9 representing the towns, 12 the country, and 9 the persons who pay most taxes. The government is in the hands of a ministry of three. As a member of the empire, Saxe-Altenburg has one vote in the council, and one representative in the diet. Altenburg (q. v.) is the seat of government. See GERMANY.

SAXE-COBURG-GOTHA (in German, *SACHSEN-KOBURG-GOTHA*), the second in point of size and population of the minor Saxon states, is a duchy comprising the duchy of *Gotha*, lying between Prussia, Schwarzburg, Meiningen, and Weimar, and containing 528 English sq. m.; pop. '95, 154,105, and the duchy of *Coburg*, 18 m. south of Gotha, lying between Meiningen and Bavaria, and containing 216 English sq. m.; pop. '95, 62,498. Total area, 734 English sq. m.; pop. '80, 194,716; '95, 216,603. The vast bulk of the population are Protestants, with Roman Catholics second; there being in 1890 202,444 Protestants, 2,909 Catholics, and 549 Jews. Gotha lies on the north side of the Thuringer-wald, which extends along and within its southern frontier; but the rest of this duchy consists of low, undulating, and very fertile land, and is watered by the Werra, an affluent of the Weser, the Unstrut, a tributary of the Saale, and several smaller streams. Coburg lies on the southern slope of the same range, is watered by the Itz and Rodach, affluents of the Main, and has extensive forests, and many beautiful valleys between the spurs of the Thuringer-wald. In the plains and valleys, the climate is mild and salubrious, but in the mountainous parts of Gotha it assumes a more inclement character. Agriculture is the principal occupation of the people, and is pursued with energy and skill; corn and flax being produced in abundance, as also potatoes, and various leguminous plants. The breeding of horses, cattle, and sheep is also successfully conducted. The mineral wealth includes coal (chiefly in Gotha), iron, cobalt, manganese; also marble, porcelain-earth, mill-stones, and salt. The manufactures are not of much importance, and are chiefly confined to Gotha. There is a large beet-sugar factory at Gotha. The extensive forests of the duchy employ a large proportion of the population in the production of pitch, tar, and potash. The duchy is a limited monarchy, in accordance with the fundamental law of May 3, 1852. Coburg and Gotha have each a *landtag*, or diet; that of the former consisting of 11, and of the latter of 19 deputies. These two landtags meet in common to decide on questions of interest to the entire state. The particular diets for the two duchies are elected by the people at large. There are two ministers for carrying on the government—one for Coburg and another for Gotha. As a member of the empire, Saxe-Coburg-Gotha has one vote in the federal council, and has the right to choose two deputies to the imperial diet. As in other German states, the troops are under the command of the emperor of Germany. Education is well diffused, and the higher education is cultivated by the several gymnasia and academies.

The finances of the two portions of the duchy are separately administered. For the period 1891-97 the estimated annual revenue of Coburg (the revenue from the crown domains, not state revenue) was 420,500 marks, the expenditure being 236,500 marks. Of Gotha, the annual revenue, 1893-97, is given at 2,144,226 marks, and the expenditure at 1,182,425 marks. The joint debt of both in 1895 was 3,228,186 marks. The present ducal family is distinguished for the spirited and liberal character of its members, as well as for physical and mental gifts. It is allied with several of the royal families of Europe, the present duke being the second son of Queen Victoria of Great Britain. The chief towns, Coburg and Gotha, had (1895) respectively, 18,689 and 31,671 inhabitants. All the Saxon ruling families are descended from the counts of Wettin, a place near Magdeburg. See GERMANY.

SAXE HOLM. See JACKSON, HELEN FISKE (HUNT).

SAXE-MEININGEN (also called **SAXE-MEININGEN-HILDBURGHAUSEN**), the third in size and population of the minor Saxon states, is a duchy, consisting of one large crescent-shaped territory, which lies immediately n. of Bavaria and Coburg, with the horns of the crescent pointing northward, and contains 862 English sq. m., and two small isolated territories, Kranichfeld and Kamburg. The area of the whole is 955 sq. m., with a pop. in '80, of 207,075; '95, 234,005. In 1866, when other administrative changes and reforms were introduced, the territory, which till then had been divided into 11 administrative districts, was distributed into 4. Of the total population, in 1895, 231,969 were Protestants; 3179 were Roman Catholics; 1487 were Jews; and the remainder Christian sectaries of various kinds. The crescent is composed of the old duchy of Meiningen, the old duchy of Hildburghausen, and the principality of Saalfeld (both of which, along with Kamburg, were annexed to Meiningen in 1826). Saxe-Meiningen forms the s. w. of Thuringia (q.v.), and is traversed in the e. and n. by the Thuringer-wald, offshoots from which also cover the w., while the Rhön-gebirge enters the country at the s.w. Its surface is thus necessarily hilly, in some places even mountainous, Kiefernle in the Thuringer-wald being 2400 ft., and Geha-berg in the Rhön-gebirge 2308 ft. above sea-level; but between the mountain ridges are numerous fruitful valleys, and that of the Werra in particular is one of the most fertile and picturesque in Germany. The Werra, Saale, Milz, Steinach, Itz, etc., water the country. Two-fifths of the country is arable land; a nearly equal extent is under wood; and the rest is meadow, garden and vineyard, and waste. In the lower lands agriculture is in an advanced condition, and is prosecuted with such vigor that corn enough is produced for home consumption; potatoes, hemp, flax, and tobacco are the other chief crops.

The mining industry of the e. and n. is considerable; and the important mineral products are iron, copper, cobalt, coal, porcelain-clay, vitriol, marble, sulphur, and salt from the works of Salzungen, Neusulza, and Friedrichs-hall. Saxe-Meiningen is also an active manufacturing district, chiefly in woolen, cotton, and linen fabrics, and paper; and brewing, distilling, the making of glass and porcelain, and various other branches of industry are prosecuted. The fabrication of wooden toys in the district around Sonneburg employs many men, and the produce is bought up by the Sonneburg dealers for export. A grape-sugar factory is maintained. Saxe-Meiningen is a limited monarchy in accordance with the fundamental law of 1829, and the laws of 1871, 1873, and 1896. The diet consists of 24 representatives—4 representing the more extensive land-owners, 4 the persons who pay most taxes, and 16 being the deputies of the rest of the inhabitants. As a member of the empire, Saxe-Meiningen has one vote in the federal council, and sends 2 deputies to the diet of the empire. The troops of Saxe-Meiningen form part of the imperial army. The government is carried on by four ministers, each of whom heads a separate department. The budget for 1894-96 gives as receipts, 7,483,980 marks; as expenditure, 6,622,440 marks. In 1896, the net public debt amounted to 9,485,558 marks. The late duke, Bernard Erich-Freund, who reigned for 63 years, spontaneously gave his subjects a liberal representative constitution in 1824. Saxe-Meiningen had for some time the distinction of being the best-governed state in Germany. See GERMANY.

SAXE-WEIMAR-EISENACH, the largest of the minor Saxon states, is a grand-duchy, consisting of *Weimar*, which lies between Prussia, Altenburg, and Schwarzburg-Rudolstadt, and contains (inclusive of Allstädt, on the Unstrut, within Prussia, 45 English sq. m., and Ilmenau, in the s. e. of Gotha, 32 English sq. m.) 675 English sq. m., with a pop. '95, of 191,975; *Eisenach*, the western portion, which lies to the n. of Meiningen and Bavaria, and contains (inclusive of Ostheim, in the Rhön-gebirge, in Bavaria, 23 English sq. m.) 468 English sq. m., with a pop. '95, of 95,226; and *Neustadt*, which lies on the western boundary of the kingdom of Saxony, and contains 242 English sq. m., pop. '95, 52,016; total area, 1385 English sq. m.; pop. '95, 339,217, of whom 325,315 were Protestants, 12,112 Roman Catholics, 1290 Jews, 500 unclassified; the Jews and Catholics being chiefly in Eisenach. The Eisenach portion is traversed in the n. by the Thuringer-wald, and in the s. by the Rhön-gebirge, the intermediate districts being also hilly and undulating, and watered by the Werra and its feeders, the Fulda, Ulster, Suhl, and Orsel. The Neustadt division is traversed from s.e. to n.w. by several offshoots of the Erz-gebirge, but most of the surface belongs to the plain of the Saale, and is watered by the Elster and Orla, affluents of that river. The Weimar portion is also

partly hilly and uneven, and partly belongs to the plain of the Saale, which, with its tributary, the Ilm, traverses it. The highest peak in the grand-duchy is Hinkelhahn (2694 ft.), in the detached territory of Ilmenau. The climate is somewhat inclement in the high lands, more temperate in the plains, and particularly pleasant along the valley of the Saale. Nearly one half of the entire population support themselves by agriculture. Agriculture is in an advanced condition, and is diligently prosecuted, there being, frequently, a surplus of grain over and above that required for home consumption, in spite of the occasional infertility of the soil; and potatoes, pulse, hemp, flax, hops, and (on the banks of the Saale) vines are also cultivated. Horse and cattle breeding is a common pursuit in Neustadt and Eisenach, and sheep-breeding in Weimar, the sheep having the usual good reputation of the Saxon breed. The mineral wealth comprises coal, iron, copper, cobalt, and marble. Eisenach is the chief seat of the manufacturing industry, with the exception of the woolen manufactures, which are principally carried on in Neustadt. The form of government is, according to the revised fundamental law of Oct. 15, 1850, a limited monarchy; the diet, or landtag, is composed of 33 deputies, 5 chosen by landed proprietors with incomes from 3000 marks upwards, 5 by those who possess the same income from other sources, and 23 by universal suffrage. The government is administered by three heads of departments. As a member of the empire, Saxe-Weimar-Eisenach has one voice in the federal council, and elects three deputies to the imperial diet. The troops of Saxe-Weimar-Eisenach form part of one of the Thuringian regiments in the 11th *corps d'armée* of the empire. The budget for the financial period 1896-98 shows annual receipts amounting to 9,656,218 marks, and an annual expenditure of an equal sum, leaving no balance in favor of the exchequer. The public debt amounted in 1896 to a total of 4,870,943 marks. The grand-duke of Weimar is the chief of the Ernestine branch of the house of Saxony. The most celebrated of the Weimar family was duke Karl-August, the Mæcenas of the art, literature, and science of Germany, who took the reins of government in 1775, and displayed extreme anxiety to favor the development of public prosperity and the progress of education. Under his fostering care, the university of Jena became a focus of intellect and knowledge to Germany; and the presence of Herder, Goethe, Schiller, and others, at his court, well entitled it to be denominated the abode of the muses. He also elevated the theatre of Weimar to its present position as the chief German school of dramatic art. In 1806 he joined the confederation of the Rhine with the title of duke, and received from the congress of Vienna an accession of territory, and the title of grand-duke. In 1816 he granted a liberal representative constitution to his subjects, expressly guaranteeing the liberty of the press, and died June 14, 1828. His successors have followed in his footsteps. See GERMANY.

SAXIFRAGE, *Saxifraga*, a genus of plants of the natural order *saxifragæ*, or *saxifragaceæ*. This order has a calyx, usually of five sepals more or less cohering at the base; a corolla usually of five perigynous petals, alternate with the sepals, rarely wanting; perigynous stamens; a hypogynous or perigynous disk; an ovary, usually of two carpels, cohering more or less by their face, but diverging at the apex; fruit generally a 1 or 2 celled capsule, the cells opening at the ventral suture, and often divaricating when ripe; the seeds usually minute and numerous. The order *saxifragæ* is sometimes regarded as including above 900 species, divided into several suborders, which are elevated by some botanists into distinct orders—leaving, however, more than 300 species to the reduced order **SAXIFRAGÆ**, which contains herbaceous plants, often growing in patches, with entire or divided alternate exstipulate leaves, natives chiefly of mountainous tracts in the northern hemisphere, and often found up to the limits of perpetual snow, some of them forming there a rich and beautiful turf, and adorning it with their very pleasing flowers. A considerable number are natives of America. Some of the genus *saxifraga* are well known in gardens, and are employed to cover rock-works, etc. *S. umbrosa*, London pride, or none-so-pretty, is familiar in all English gardens. It is a native of the hills of Spain, and of the s. and w. of Ireland.

SAXO-GRAMMATICUS (i.e., Saxo the “grammarian” or “scholar”), the most celebrated of the early Danish chroniclers, flourished in the 12th c., and was secretary to archbishop Absalom. He is said to have died at Roeskilde after 1208. Saxo-Grammaticus undoubtedly formed his style on that of the later Roman historians, particularly Valerius Maximus, yet in his whole mode of representation he belongs to the school of mediæval chroniclers, although ranking first in that school. Erasmus half wondered at his elegance. Moreover, it adds mightily to our respect for Saxo-Grammaticus that, although a cleric, he did not in the very least degree allow himself to be swayed in his historical conceptions by the prejudices incident to his profession. His work is entitled *Historia Danica*, and consists of 16 books. The earlier portions are of course not very critical, but in regard to times near his own, Saxo-Grammaticus is a most invaluable authority. According to his own statement, he derived his knowledge of the remoter period of Danish history—the “heroic age” of the n.—from old songs, runic inscriptions, and the historical notices and traditions of the Icelanders; but he is not sharply critical in his treatment of the Danish sagas, although a rudimentary critical tendency is occasionally visible. The best edition of the *Historia Danica* is that undertaken by P. E. Müller, and finished by J. M. Velschov (Copen. 1839). It is furnished with a

complete critical apparatus. There are good translations from the original Latin into Danish.

SAXON ARCHITECTURE, the style of building used in England before the introduction of the Norman architecture at the conquest. There are few specimens remaining which can be depended upon as genuine. The Saxons built chiefly in wood, and all their wooden edifices are now lost. It seems probable that a rude and simple style, not unlike early Norman, was that used by the Saxons. There are several buildings in England which Mr. Rickman considers entitled to rank as Saxon. Amongst these, the tower of earl's Barton, Northamptonshire, is one of the best examples. The peculiar "long and short" work of the quoins, the projecting fillets running up the face of the walls, and interlacing like wood-work, and the baluster-like shafts between the openings of the upper windows, are all characteristic of the style. See **ARCHITECTURE**.

SAXON LAND. See **TRANSYLVANIA**.

SAXON STATES, MINOR. The capitulation of Wittenberg, which followed the rout of Muhlberg (see **SAXONY**), and deprived John Frederick the magnanimous of the electorate of Saxony, at the same time despoiled him of a large portion of the hereditary possessions of the Ernestine branch. The remainder, amounting—after the acquisition of Coburg, Altenburg, Eisenberg, etc., in 1554—to little more than one-fifth of the whole Saxon territory, was divided into two portions, *Saxe-Gotha* and *Saxe-Weimar*, the former falling to John Frederick II., and the latter to John William, the two sons of the deposed elector. Each of these portions was afterward subdivided, the former into *Saxe-Coburg* and *Saxe-Eisenach*, and the latter (1573) into *Saxe-Weimar* and *Saxe-Altenburg*. It would only bewilder the reader to attempt to follow the endless subdivisions and reunions that followed. Suffice it to say that the gradual adoption of the law of primogeniture during the 18th c., and the extinction of various cadet branches, has left the four states of *Saxe-Altenburg*, *Saxe-Coburg-Gotha*, *Saxe-Meiningen*, and *Saxe-Weimar-Eisenach*, as described under their several names. Should the Albertine or Saxon-royal line become extinct, the duke of Weimar succeeds to the throne; and failing his family, the lines of *Saxe-Meiningen*, *Saxe-Altenburg*, and *Saxe-Coburg-Gotha* obtain in this order the right of succession.

SAXON SWITZERLAND. See **SAXONY**.

SAXONS (Lat. *Saxōnes*, Ger. *Sachsen*), a German people, whose name is usually derived from an old German word *sahs*, meaning a "knife," are first mentioned by Ptolemy, who makes them inhabit a district s. of the Cimbrian peninsula. Toward the end of the 3d c., a "Saxon league" or "Confederation" makes its appearance in north-western Germany, to which belonged, besides Saxons proper, the Cherusci, the Angrivarii, and the largest part of Chauci. In the times of the emperors Julian and Valentinian, Saxons and Franks invaded the Roman territory; but their piratical descents on the coasts of Britain and Gaul are far more famous. At what period these commenced, it is impossible to tell, but it is believed to have been much earlier than is commonly supposed. Recent investigations seem to prove that Saxons had established themselves in England long before the time of the mythical Hengist and Horsa (see **ANGLO-SAXONS**); and we know that as early as 287 A.D., Carausius, a Belgic admiral in the Roman service, made himself "Augustus" in Britain by their help. They had firmly rooted themselves, at the beginning of the 5th c., in the present Normandy, where a tract of land was named after them, the *Limes Saxonicus*. They fought against Attila (q.v.) in the Catalaunian plain, 451 A.D. They also obtained a footing at the mouth of the Loire; but all the Saxons who settled in France "disappeared" before the Franks, i.e., were probably incorporated with their more powerful kinsmen of southern Germany. At home, the Saxons (called *Alt Sachsen*, or "Old Saxons," to distinguish them from the emigrant hordes who found their way to England and France) enlarged, by conquest, their territory n. and n.w. as far as the North Sea, the Yssel, and the Rhine; s., as far as the Sieg, and nearly to the Eder; eastward, to the Weser and Werra, the southern Harz, the Elbe, and the Lower Saale. Along with the Franks, they destroyed the kingdom of the Thuringians in 531, and obtained possession of the land between the Harz and the Unstrut; but this district was in turn forced to acknowledge the Frankish sovereignty. From 719, wars between the Saxons and the Franks became constant; but the latter, after 772, were generally successful, in spite of the vigorous resistance offered by Wittekind; and 804, the Saxons were finally subjugated by the arms of Charlemagne. Wittekind was the last Saxon king, and the first Saxon duke of the German empire. A collection of the old national laws and usages of the Saxons, under the title of *Lex Saxonum*, was made during the reign of Charlemagne.

During 1830-40, A. Schmeller published (from two manuscripts, one preserved at Munich, and the other in the British museum) an "Old Saxon" poem of the 9th c., called *Heliand*, i.e., the "Healer," or "Saviour," which narrates in alliterative verse the "History of Christ" according to the gospels, whence it is also called the "Old Saxon Gospel Harmony." It is probably a part of a more comprehensive work, embracing a poetical treatment of the history of the Old and New Testament, which Ludvig the pious intrusted to some celebrated Saxon singer. This unknown poet lived, as his language leads us to conjecture, somewhere between Münster, Essen, and Kleve. His work is

not only the almost sole monument of the old Saxon tongue left us, but is also of high poetical value, through its warmth of feeling, and the strength and splendor of its diction—worthy, indeed, to take its place alongside the contemporary Anglo-Saxon and old Norse poetry.

SAXONY (Ger. *Sachsen*), KINGDOM OF, the second in importance and population of the minor German states, though inferior to three of them in extent, is bounded on the n. by Prussia, s. by Austria, and w. by Bavaria, and the Saxon duchies. The following table shows the area and population of the four administrative circles in 1895:

	English Sq. Miles.	Pop. in 1895.
Dresden	1674	1,067,757
Leipsic	1378	945,179
Zwickau	1782	1,389,672
Bautzen	953	385,082
Total	5787	3,787,690

Of the total population 48.8 per cent. were living in the 143 cities and 66 per cent. were living in the cities and communes that had a population of over 2000. Saxony is one of the most densely populated countries in the world. The kingdom is somewhat of the form of a right-angled triangle, with the right angle in the n.w., and the longer side lying along the foot of the Erz-gebirge range, which sends its spurs northward over the southern half of the country, giving to that portion a somewhat mountainous character, while the northern half remains a flat or undulating plain. The whole country, with the exception of a small portion in the extreme e., which belongs to the Oder basin, and is watered by the Neisse, is drained by the Elbe (which is wholly navigable in Saxony) and its tributaries the Muglitz, Wilde-Weisseritz, Trubsch, Mulde, and White Elster, on the w., and the Wessnitz, Black Elster, and Spree on the east. From the point where the Elbe bursts through the Erz-gebirge chain to within about 8 m. of Dresden, it traverses a district rich in picturesque scenery, to which the somewhat inappropriate name of *Saxon Switzerland* has been given. This district, which averages about 24 m. long by 23 broad, is an elevated plateau of coarse crumbling sandstone (much resembling the English greensand); and though destitute of the perpetually snow-clad mountains, glaciers, serrated ridges, and escarped peaks which give a character of lofty grandeur to its namesake, it can boast of features equally peculiar and strikingly romantic. From the soft nature of the rock, it has yielded freely to the action of the mountain rills, which rise from the hills on its e. and w. borders, and converge to the Elbe, and is cut up in all directions by deep narrow gorges (so symmetrical in their formation as to resemble artificial lanes), the constantly deepening beds of these mountain torrents, which here form cascades, there sullenly glide through deep vales bordered by rocks of the most fantastic forms, or by steep rugged slopes thickly clad with trees. High above the level of the plateau rise towering rocks, some of them pyramidal or conical, others pillar-like, while a few taper almost to a point, and then bulge out at the top; all clearly testifying to the agency by which they have been produced. The mediæval knights took advantage of these curious results of nature's so-called freaks, to erect castles upon the summits of some of them; several of these castles still exist, and one of them, Königstein, is almost the only virgin fortress in Europe. The most remarkable of these peaks are Königstein (864 ft.), Lilienstein (1254 ft.), the Bastei (600 ft.), Nonnenstein, Jungfernsprung, and seven others, each of which possesses its group of traditionary gnomes and kobolds. The lakes of Saxony are unimportant.

Climate, Soil, Products, etc.—The climate is healthy, and on the whole temperate, though occasionally severe in the south-western districts. By far the greater part of the surface is under cultivation. Taking the country as a whole, about one-fourth is under forest, but the proportion varies greatly in different districts. In Borna, for instance, it is only 6.8 per cent., while in Schwarzenberg it is 60.1 per cent. The proportion of arable land also varies in different parts of the country, the largest percentage being found in the district of Oschatz and the smallest in Auerbach. The arable land has long been in a high state of cultivation, as is the case with the whole of Upper Saxony (see *History*), yet, notwithstanding this and its extreme fertility, the produce is hardly sufficient to supply the wants of the dense population (654.5 to the English sq. mile). The agricultural products consist of the usual cereals and leguminous plants, with rape, buckwheat, hops, flax, and potatoes, and all kinds of fruits suited to the climate. The forests, the largest of which are in the Voigtland (the s.w. corner of Zwickau), and along the northern slopes of the Erz-gebirge, supply timber of excellent quality, and in such abundance as to render them one of the great sources of wealth and industry. The rearing of cattle is an important employment in the mountainous districts of the s.w. Sheep-breeding was formerly very important, the so-called "electoral wool" being highly esteemed, but the industry has declined, though it is still pursued in several parts of the country such as Leutewitz, Lützhain, Machern, Lützschena, Klipphausen, Oschatz, etc. Minerals are another great source of national wealth, the ore being both rich and abundant, and the processes of excavation and smelting in a high state of perfection. The mineral wealth includes silver, tin, iron, cobalt, bismuth, zinc, lead, nickel, arsenic, antimony, and other metals, besides coal, marble, porcelain-earth, vit-

riol, and various gems. The most important mineral is coal. In 1894 the value of the output of all the mines was 44,034,000 marks, of which coal and lignite made up 40,311,000 marks. By the law of May 21, 1851, all mines for metallic ores belong to the government.

Manufactures.—Manufacturing industry has also been greatly developed, and several branches have been carried to a high degree of perfection. It now ranks as one of the leading industrial states in the world, and, in proportion to its size, is the most important in this respect in the German empire. According to the census of manufactures in 1895, there was a great increase in the numbers engaged in all manufacturing operations since 1882. The largest part of the working population were engaged in the mining and manufacturing industries. The most important of all were the textile industries, whose principal seat is in Zwickau. Linen was formerly one of the most important of the textile manufactures, being the oldest, but in recent years it has sunk to an inferior rank. Its chief seat is Lausitz. The manufacture of cottons is important. Broadcloth, thread, merinos, silks, mixed silk, and woolen wares, etc., are also produced in considerable quantity, and of excellent quality; the muslins de laine being still preferred by many to those of England and France, while the laces and embroideries preserve their ancient well-won reputation. Saxon pottery and porcelain have long been famous. The chief centers of manufacturing industry are in Bautzen and in the mountainous country to the n. of the Erz-gebirge. The country is well provided with roads, railways, and lines of telegraph.

Government, Religion, Education, Revenue, etc.—The government of this very interesting country—the reading of the history of which leaves on one's mind a firm sense of both past ages and present activity—is a limited monarchy, hereditary in the Albertine line, and is carried on according to the constitution of Sept. 4, 1831, frequently modified by changes between the years 1849 and 1896. By the electoral law passed in the year 1868, the first of the two chambers which constitute the legislature consists of the princes of the royal family, certain nobles, representatives of the Lutheran and Roman Catholic churches, the chief proprietors, representatives of the universities, and the burgomasters of the eight principal towns. The second chamber comprises deputies from the towns, and from the rural communes. The supreme administration is managed by six ministers (of justice, finance, the interior, war, religion and education, and foreign affairs). The established religion is the Lutheran, though the reigning family, since the time of Fr. Augustus I., have been Roman Catholic. The church department must, so long as the reigning family remains Catholic, be administered by a member of the established church. In 1890 there were 3,337,850 Lutherans (95.6 per cent.) and 128,509 (3.67 per cent.) Roman Catholics. The population of Saxony is by no means purely German; in 1890 there still were upward of 50,000 who spoke Wendish. Saxony is well provided with educational institutions. Besides the great university at Leipsic (q. v.), it has numerous gymnasiums, real schools, and elementary schools, as well as a great variety of institutions for special and technical instruction. The railways are the property of the state, and in 1895 their total length was 1729 miles. The Saxon troops form the twelfth *corps d'armée* of the German empire. Saxony has a war ministry of its own; but after the war of 1866 Saxony paid the penalty of her opposition to Prussia by being compelled to make over to the king of Prussia the supreme military command of the Saxon army, the right to garrison the fortress of Königstein, the management of the postal, railway, and telegraphic systems, and the charge of the diplomatic representation of Saxony abroad. As a member of the German empire Saxony has four voices in the federal council, and has a right to send 23 deputies to the diet.

History of the Great Duchy of Lower Saxony, and of the Ascanian Electorate of Upper Saxony.—After the final conquest of the Saxons by Charlemagne they became one of the components of the German empire; but their country by no means corresponded to what is now known as Saxony. It included the most of the country between the Elbe, the Harz mountains, the Rhine, and Friesland; and, in 850, was erected into a dukedom, with Lubeck for its capital, and ruled by hereditary princes. Ludolf, the first duke, is said to have been the great-grandson of Wittekind, but nothing is certainly known of his ancestry. His second son, Otho the illustrious (880–912), was the most distinguished of the German princes; he fought valiantly against the Normans, and, on the extinction of the Carolingian dynasty (911), refused the crown of Germany which was unanimously offered him by the electors. His son duke Henry (912–936), surnamed “the Fowler,” obtained the throne (919), and commenced the Saxon line of German sovereigns, which was continued by Otho I. (q. v.), Otho II. (q. v.), Otho III. (q. v.), and Henry II., and ended in 1024. Otho I. handed over the great duchy of Saxony to Hermann Billung in 960, on condition of military service; and this family held it till 1106. Under the Billung dynasty the prosperity of the country greatly increased, and Meissen, Thuringia, East Saxony in Lusatia, Saxony in the Northern Mark, Anhalt, Saltzwedel, and Slesvig were all dependent on the Saxon duke. A portion of Saxony had, however, been reserved by the emperor, Otho I., for his nephew Bruno, who founded a lordship of Saxony-Brunswick; and, in the middle of the 11th c., a duchy of “Saxony on the Weser” was also founded; but both of these (united by marriage in 1090 or 1096) came (1113) by marriage to count Lothar of Supplinburg, who was also invested (1106) with the great

duchy of Saxony, which was now more extensive than ever, stretching from the Unstrut in Gotha, to the Eider, and from the Rhine to Pomerania. After Lothar's accession to the imperial throne in 1125, he handed over (1127) the duchy to his son-in-law, Henry the Proud, the Guelphic duke of Bavaria, who was thus the ruler of more than half of Germany; but this overgrown dominion did not long exist, for under his son, Henry the lion (q.v.), it was wrested (1180) from the house of Guelph, Bavaria being given to the house of Wittelsbach; East Saxony created an electorate, and given to Bernhard of Ascania; Brunswick and Luneburg mostly restored to Henry's son; while the numerous and powerful bishops of Northern Germany divided among themselves Westphalia, Oldenburg, and many portions of Luneburg and Brunswick; Mecklenburg and Holstein became independent, and the Saxon palatinate in Thuringia went to the landgraf Ludwig. Saxony, now shorn of its former greatness, consisted chiefly of what is now Prussian Saxony, a few districts separated from Brandenburg, and Saxe-Lauenburg, the last being the only portion of the great duchy of Saxony, or *Lower Saxony*, as it is called, which retained the name. Wittenberg was the capital of the new duchy. Saxony was diminished in 1211 by the separation of Anhalt as a separate principality; and in 1260 it was permanently divided into two portions, *Saxe-Lauenburg* and *Saxe-Wittenberg*, to the latter of which the electoral dignity remained, and to which, on subsequent dispute between the two branches, it was confirmed by the celebrated Golden Bull (1356). The Ascanian line became extinct in 1422 with duke Albert III., and the duchy then passed to Frederick the Warlike, markgraf of Misnia, and landgraf of Thuringia, who was invested with it by the emperor Sigismund in 1423. His possessions consisted of Thuringia, the present kingdom of Saxony, Prussian Saxony, in fact the whole of *Upper Saxony*, with the exception of Anhalt.

History of the country now known as Saxony.—The earliest inhabitants of upper Saxony, since the Christian era, were the Hermunduri (see THURINGIA), and on the destruction of the great Thuringian kingdom in the beginning of the 6th c., their settlements were taken possession of by the Sorbs, a Slavic race, who practiced agriculture and cattle-breeding. The Carolingian rulers, dissatisfied with the ingress of those non-German tribes, erected "marks" to bar their progress; and Duke Otho the Illustrious of Saxony, and his celebrated son, Henry the Fowler, warred against them, the latter subduing the Heveller, the Daleminzer, and the Miltzer—founded in their country the marks of Brandenburg (q.v.), Misnia (Meissen), and Lusatia (Lausitz), and planted colonies of Germans among the Sorbs. In 1090 the mark was bestowed on the house of Wettin (a supposed off-shoot of the race of Wittekind), and was confirmed as a hereditary possession to that family in 1127; and the markgraf, Henry the Illustrious (1221–88), whose mother was heiress to the landgrafdom of Thuringia, with its appendages, combined the whole into a powerful state. Business, commerce, and mining industry now flourished; great roads for commercial purposes were constructed throughout the country, and the Leipsic fairs were established; and, in spite of much internal discord, and frequent partitions of Saxony, its prosperity increased. At last **FREDERICK THE WARLIKE** (1381–1428) succeeded in uniting the several portions of Saxony, to which were added, by purchase and marriage, various districts in Franconia; and in 1423 the electorate of Saxony (see above). The Saxon elector was now one of the most powerful princes of Germany; but unfortunately the fatal practice of subdividing the father's territories among his sons still continued, and during the reign of the elector **FREDERICK THE MILD** (1428–64), whose brother William had obtained Thuringia, a civil war broke out, and was carried on for years. **ERNEST** (1464–86) and **ALBERT** (1464–1500), the sons of Frederick, in accordance with the will of their father, reigned conjointly over the hereditary domains of the family (the duchy of Saxony with the electoral dignity, being reserved always to the eldest) till the death of their uncle (1485), when Ernest obtained Thuringia, and Albert, Meissen, while Osterland was equally divided between them. Ernest, the founder of the *Ernestine*, which was also the *elder* or *electoral line*, was succeeded by his son, **FREDRICK THE WISE** (1486–1525), who favored the reformation, and firmly supported and protected Luther against the overwhelming power of the Catholic party, which he was enabled to do, from his personal influence with the emperors Maximilian and Charles V. His brother and successor, **JOHN THE CONSTANT** (1525–32), was still more a partisan of the new doctrines, as was also his son and successor, **JOHN FREDERICK THE MAGNANIMOUS** (1532–47); but the latter, by the defeat of Muhlberg (q.v.) (see **SCHMALKALD**), was forced to resign both his electoral dignity and his states. Albert, the founder of the *younger*, *ducal*, or *Albertine line*, was succeeded by his sons, George the Bearded (q.v.), (1500–39), a rabid Catholic, and **HENRY THE PROUS** (1539–41), a no less zealous Protestant; after whom came the celebrated **MAURICE** (1541–47) who was a professed Protestant, but joined the Catholic party against the league of Schmalkald, obliged the Protestant army to retreat from the Danube, and took possession of the estates of the elector John Frederick, who, however, speedily drove him out, and took possession of ducal Saxony in his turn. After the rout of the Protestants at Muhlberg, Maurice received the electoral title (1547–53), and the greater portion of the estates of his vanquished cousin. But the arbitrary political measures and religious severities which were either instituted or promoted by the emperor, induced Maurice to join the Protestants, and, by a sudden march on Innspruck, he forced the emperor to agree to the peace of Passau. New tyrannical measures of the emperor

caused him to look to an alliance with France, but the scheme was frustrated by his death, July 11, 1553, near Sievershausen, where two days before he had totally defeated the markgraf Albert of Kulmbach, a secret agent of the emperor's. His brother, August I. (q.v.) (1553-86), the first economist of the age, has left a memory dear to Saxony, from the numerous excellent institutions which he established; he considerably increased his territories by purchase and otherwise, and restored Altenburg to the Ernestine line. CHRISTIAN I. (1586-91), a weak prince, surrendered the reins of government to his chancellor, Crell, who was sacrificed, in the succeeding reign of CHRISTIAN II. (1591-1611), to the revenge of the offended nobility. Christian II. weakly neglected to assert his claims to Juliers, on the death of its last duke, and allowed it to become a prey to Brandenburg and the palatine house of Neuburg; but his brother, JOHN GEORGE I. (1611-56), in revenge for this spoliation, allied himself to Austria, and conquered upper and lower Lusatia and Silesia. Subsequently the good understanding between these powers was destroyed, and the elector allied himself with Gustavus Adolphus (1631), and took part in the thirty years' war. But on the death of Gustavus the Elector separated from the Swedes, and made a separate peace (1635) with Austria, by which he obtained upper and lower Lusatia, acquisitions confirmed by the general treaty of Westphalia (1648). This was the period of the electorate's greatest power. His sons, JOHN GEORGE II. (1656-80), August, Christian, and Maurice, divided the estates, the three latter founding cadet lines, all of which became extinct before 1750. The reigns of his successors, JOHN GEORGE III. (1680-91) and JOHN GEORGE IV. (1691-94), are unimportant, but that of Frederick August I. (q.v.) (1694-1733) well-nigh ruined the hitherto prosperous electorate. Frederick August had been chosen king of Poland; and his attempt, in company with the czar and the king of Denmark, to dismember Sweden brought down upon him and his two states the vengeance of the northern, "fire-king." Poland was utterly devastated, and Saxony exhausted of money and troops. Besides, the king's habits were most extravagant, and to maintain his lavish magnificence, he was forced to sell many important portions of territory. Frederick August II. (q.v.) (1733-63), also king of Poland, took part in the war of the Austrian succession (see SUCCESSION WARS) against Maria Theresa, but finding the treaty of Berlin (1742) not satisfactory for himself, he joined the empress in 1745. The country was atrociously ravaged during the seven years' war (q.v.), and a long time elapsed before it recovered its previous peaceful and prosperous state. FREDERICK CHRISTIAN (1763-63) and FREDERICK AUGUST I. (1763-1827), labored zealously for the good of their subjects; and under the reign of the latter, agriculture, manufacturing, and industrial enterprise progressed with rapid strides. In spite of his love for peace the elector was led into the quarrel respecting the Bavarian succession (q.v.); but he refused the crown of Poland in 1791, and declined to take part in the convention of Pilnitz, though he joined the Prussian confederation of German princes, and had an army of 22,000 Saxons at the battle of Jena. But the pressure of the French compelled him to join the confederation of the Rhine in 1806, and from this time his army fought side by side with the French. He obtained the union to Saxony of the duchy of Warsaw (see POLAND); but fearing that the disasters of the French, in 1812, would be fatal to their supremacy, and to the interest of Saxony, he withdrew to Bavaria, and thence to Prague, renounced the duchy of Warsaw, and made every attempt to come to amicable terms with the allies. But he was again compelled to join the French, between the battle of Lutzen (May 2, 1813) and that of Leipsic (Oct. 16-19, 1813), after which he became the prisoner of the allies, and his army was joined to theirs. For his support of Napoleon he was deprived of the greater portion of Saxony, which was handed over to Prussia, but he retained the title of king, which had been conferred upon him in 1806. The rest of his reign was occupied with internal reforms. ANTONY (1827-36) reformed the entire legislation of the country, and granted a liberal constitution, being urged thereto by a popular outbreak in the autumn of 1831. The constitution was proclaimed Sept. 4, 1831, and the state's representatives first assembled, Jan. 27, 1833. FREDERICK AUGUST II. (1836-54), his nephew, who had been regent for several years, now succeeded, and though favorable to constitutionalism, he was unable to obtain the smooth and harmonious working of the new system. In 1843 violent contests commenced, accompanied by occasional riots in the principal towns, on the subject of the liberty of the press, and the publicity of legal proceedings. Sometimes the constitutionalists, and sometimes their opponents, gained the supremacy, and for a long time the efforts of the two parties counteracted each other. Toward the close of the king's reign he was a mere tool in the hands of the reactionary party, headed by his brother JOHN, who succeeded in 1854. John, however, supported constitutionalism, and established courts of justice throughout the kingdom. For the hostile attitude assumed by Saxony toward Prussia before 1866, and its subsequent history, see GERMANY.

SAXONY, PRUSSIAN, the most westerly, undetached province of Prussia, bounded on the e. and n.e. by the province of Brandenburg. Area, 9747 sq. m.; pop. '95, 2,698,549. The west districts are occupied by the Harz mountains, and the peak of the Brocken (3745 ft. high) is the chief elevation. The greater portion of the surface, however, is level, and slopes toward the n., in which direction flow the principal rivers—the Elbe, with its tributaries, the Saale and Mulde. Coal, salt, and other minerals occur in great abundance. Both manufactures and agriculture are thriving. The larger portion of

Prussian Saxony (7911 sq. m.) was detached from the kingdom of Saxony, and ceded to Prussia, by decree of the congress of Vienna, 1815.

SAXOPHONE, an instrument invented by Adolphe Sax, and used in military bands. It consists of a conical brass tube, having twenty lateral orifices covered by keys, and it is played by means of a mouthpiece and a simple reed like the clarinet. The Saxophone is made in a number of sizes, representing in all seven different keys.

SAXTON, JOSEPH, 1799-1873; b. Penn.; received a common-school education; in his youth made improvements in machinery for nail factories; went to Philadelphia, 1817; invented there a machine for cutting the teeth of chronometer wheels, and an escapement with compensating pendulum, and constructed a clock for the steeple of Independence hall, which remained a long time in use; resided 9 years in London, where he became intimate with Faraday; was chosen principal assistant in the Adelaide gallery of science, and made several valuable mechanical contrivances. Having returned to Philadelphia, he superintended the making of machinery for the U. S. mint, and afterward had charge of the construction of standard weights and measures, accurate sets of which he furnished for the state capitals and the custom-houses. He received several gold medals for his skillful inventions. Among his ingenious contrivances may be mentioned the mirror comparator for comparing standard measures, and the tracing machine for dividing them; the deep-sea thermometer, used by the U. S. coast survey in exploring the Gulf stream; the self-registering tide gauge; and the immersed hydrometer.

SAY, JEAN BAPTISTE LÉON, b. Paris, 1826; grandson of Jean Baptiste, the political economist. He made a special study of political economy, and for years was editor of the *Journal des Débats*. He was prefect of the dept. of the Seine in the national assembly, 1871; minister of finance 1872-3, 1875-7, 1878-9, and for a few months in 1882; and was a member of the senate, 1875-82. He presided over the international monetary conference at Paris, 1878; was sent to London as ambassador, 1880, but was shortly afterwards elected pres. of the senate and returned to Paris. He was considered an authority upon financial and economical questions, and has published among other works, *Théorie des Changes Étrangers*; *Histoire de la Cuisse d'Escompte*, in conjunction with Léon Walrus; *Les Obligations Populaires*; and *Les Finances de France*. He died in 1896.

SAY, JEAN BAPTISTE, an eminent French economist, was b. at Lyon, Jan. 5, 1767. Being destined by his father for a commercial career, he passed a part of his youth in England; and on his return to France, obtained a situation in a life insurance company, about which time he made his first acquaintance with the works of Adam Smith. During the revolution, he was for some time secretary to Clavière, the minister of finance; and from 1794 to 1800 edited a journal called *La Décade*, in which he expounded with great effect the views of Smith. Already Say had acquired a distinguished reputation as a thinker by his *Traité d'Economie Politique, ou Simple Exposé de la Manière dont se forment, se distribuent et se consomment les Richesses* (Paris, 1803), and other works. Called to the tribunate in Nov., 1799, he was not slow to express his disapprobation of the arbitrary tendencies of the new consular government, and in 1804 he ceased to be a member of a body that had become a mere tool in the hands of Bonaparte. Under the despotism of the empire, Say was forced into private life, and betook himself to industrial pursuits, establishing (along with his son) at Auchy a large spinning-mill, which soon employed not less than 500 workmen; and when Bonaparte fell, Say found himself at the head of the economical and commercial movement that marked the epoch. In 1814 the second edition of his now celebrated *Traité* appeared, dedicated to the emperor Alexander, who had long called himself his "pupil;" and in the same year the French government sent him to England to study the economical condition of that country. In 1819 a new chair, that of *Economie Industrielle*, was created for him at the *Conservatoire des Arts et Métiers*; and Say added both to his influence and his popularity by the lucidity, grace, and intensity of conviction displayed in his lectures. In 1831 he was appointed professor of political economy at the *Collège de France*, but died Nov. 15, 1832. Although strictly a follower of Adam Smith, Say was an independent, sagacious, and penetrative thinker. Ricardo speaks of his works as containing "several accurate, original, and profound discussions." He was the first to teach Frenchmen to consider rationally such questions as customs duties, the currency, public credit, the colonies, and taxation; and though the brilliant socialistic theorizers say that he was not an *économiste spiritualiste*, many will consider that defect a merit. Besides his *chef d'œuvre* already mentioned, Say wrote (among other works) *De l'Angleterre et des Anglaises* (Par. 1812), *Catéchisme d'Economie Politique* (Par. 1815), *Lettres à Malthus* (Par. 1820), *Cours Complet d'Economie Politique* (Par. 1828-1830), and *Mélanges et Correspondance* (Par. 1833).

SAY, THOMAS, 1787-1834; b. Philadelphia; in his youth engaged in trade, but meeting with no success, began the study of natural history and was a contributor to the journal of the Philadelphia academy of natural science, of which he was one of the founders. From 1818 to 1825 he was engaged in several scientific exploring expeditions, one being that of Long (q.v.), to the Rocky mountains. In 1825 he settled at New Harmony, Ind., and there spent the rest of his life. He made many discoveries in zoology and conchology, and especially in entomology. His principal works were *American Entomology* and *American Conchology*.

SAYBROOK, a town in Middlesex co., Conn.; on the Connecticut river and the New York, New Haven, and Hartford railroad; about 10 miles from Long Island sound. It is also on the line of steamboats between New York and Hartford. The town was settled in 1635 in what is now Old Saybrook, near the mouth of the river; was named after lords Say and Brook; united with Connecticut in 1644; and formerly included the towns of Old Saybrook, Westbrook, Essex, Chester, and part of Lyme. It has a union school, Acton public library, town hall with theater, national and savings banks, weekly newspaper, post-offices at Deep river and Winthrop, and manufactories of piano keys, ivory and bone goods, wire goods, button hooks, crochet needles, boring implements, etc. Pop. '90, 1484.

SAYCE, ARCHIBALD HENRY, b. Shirehampton, near Bristol, Eng., 1846; graduated at Oxford; was elected fellow, 1869, and tutor, 1870; was ordained priest in the Church of England, 1871, and became deputy-prof. of comparative philology, 1876. He was appointed a member of the Old Testament revision committee, 1874. His more important works are, *An Assyrian Grammar for Comparative Purposes* (1872); *The Principles of Comparative Philology* (1874); *Introduction to the Science of Language* (1880); *The Monuments of the Hittites* (1881); *Records of the Past* (2nd series, 1888-91); *Patriarchal Palestine* (1895); *The Egypt of the Hebrews* (1895), etc. He became professor of Assyriology at Oxford in 1891.

SAYRE, LEWIS ALBERT, b. New Jersey, 1820; graduated at Transylvania university in 1837; studied medicine with Dr. David Green in N. Y. city; graduated at the college of Physicians and Surgeons in 1842; became prospector to Dr. Willard Parker, the professor of surgery in that college, and in 1859-60 professor of orthopedic surgery in Bellevue hospital medical college. He is the author of several papers on orthopedic, or reparative surgery.

SAYRE, STEPHEN, 1734-1818; b. Long Island; educated at the college of New Jersey. He was a prosperous banker in London, of which he was elected sheriff. He enjoyed the confidence of the earl of Chatham; and his known zeal for the cause of the American colonies caused his imprisonment in the Tower on a charge of high treason, advantage being taken of an unguarded expression. He was released, but was financially ruined. He was for some time private secretary to Franklin, who employed him on several missions, as did Arthur Lee.

SCAB, in sheep, like itch in man, or mange in horses or dogs, depends upon the irritation of a minute acarus, which burrows in the skin, especially if dirty and scurfy, causing much itching, roughness, and baldness. The parasite readily adheres to hurdles, trees, or other objects against which the affected sheep happen to rub themselves, and hence is apt to be transferred to the skins of sound sheep. Chief among the approved remedies are diluted mercurial ointments, tobacco-water, turpentine and oil, and arsenical solutions, such as are used for sheep-dipping. One of the best and simplest applications consists of a pound each of common salt and coarse tobacco, boiled for half an hour, in about a gallon of water; to this are added 2 drams of corrosive sublimate; and the mixture diluted until it measures three gallons. For each sheep, a pint of this mixture should be carefully applied, from a narrow-necked bottle, along the back, and to any other scurfy itchy parts. A second dressing, after an interval of a week, will generally effect a perfect cure.

SCABBARD is the sheath for a sword or bayonet, at once to render the weapon harmless and to protect it from damp. It is usually made of black leather, tipped, mouthed, and ringed with metal. For ancient form see *illus. ANCIENT ARMOR*, vol. I.

SCABBARD-FISH, *Lepidopus argyreus*, an acanthopterous fish, belonging to the family *trichiuridae*, and nearly allied to the mackerels. The members of the genus *lepidopus*, are tænioid fishes with elongated snouts, projecting under jaws, and strong, sharp, cutting teeth. The ventral fins are reduced to small scaly plates, but there is a well formed forked tail. See *TRICHIURIDÆ*.

SCABIOUS (*Scabiosa*), an extensive genus of herbaceous plants, exclusively natives of the eastern hemisphere, of the natural order *dipsacaceæ*. See *TEASEL*. The flowers are collected in terminal heads, surrounded by a many-leaved involucre, so as to resemble those of the order *compositæ*. The DEVIL'S-BIT SCABIOUS (*S. succisa*) is a very common autumnal flower in British pastures. The plant possesses great astringency, but no important medicinal virtues, although it was formerly supposed to be of great efficacy in all scaly eruptions, and hence the name scabious, from Latin *scabies*, leprosy. The end of the root appears as if abruptly bitten off, and the superstition of the middle ages regarded it as bitten off by the devil, out of envy, because of its usefulness to mankind!

SCAD, *Caranx trachurus*, or *trachurus vulgaris*, a fish of the family *scomberidæ*, sometimes called the *horse mackerel*, because of its resemblance to the mackerel, and its comparative coarseness. It is from 12 to 16 in. long, of a dusky olive color, changing to a resplendent green, waved with a bluish gloss, the head and lower parts silvery, the throat black. There are two small free spines in front of the anal fin. The species of *caranx* are very numerous, and it is sometimes divided into several genera; but the scad is the only one found on the British coasts. It is common on the south-western coasts of England, but comparatively rare to the north. It sometimes appears in immense shoals.

SCAGLIOLA, a composition made to imitate the most costly kinds of marble, and other ornamental stones; and so successfully is it done, that it is often difficult to distinguish between the artificial and the real stone. It consists of finely ground plaster of Paris mixed with a thin solution of fine glue, and colored with any of the earthy colors, such as ochers, umber, Sienna earth, Armenian bole, and sometimes chemical colors, such as the chrome yellows, etc. This is spread over the surface intended to represent marble; and while still soft, pieces of fibrous gypsum, marble, alabaster, and other soft but ornamental stones, are pressed into it, and made level with the surface. When the composition is set hard, it is rubbed down, and polished with the ordinary stone-polishing materials, which give it a very fine gloss. This kind of work is only adapted for interiors, because scagliola will not bear exposure to damp for any length of time; but its lightness, and the extreme ease with which it may be applied to walls, pillars, pilasters, and even cornices, render it very useful for the decoration of the better class of dwellings and public buildings.

SCALA, the name of an Italian family whose seat was Verona, of which place the Ghibelline **MASTINO DELLA SCALA** was elected *podesta* in 1260. After being in office five years he was made perpetual capt. of the city. Assassinated in 1273, he was succeeded by his son, Albert, who was soon made lord of Feltre, Vicenza, and Belluno. The greatest of the family was **CAN FRANCESCO**, or **Can Grande**, as he was called (1290-1329) the friend of Dante, and who filled his court with sculptors, poets, and painters. He was capt. of the alliance between Mantua, Verona, Este, and other cities; an ally of Henry of Luxembourg; and the head of the Ghibellines in Lombardy. His power extended over almost all the later Venetia, including Este, Cremona, Monselice, Padua, Feltre, Vicenza, and Treviso. His descendants ruled till 1387, when Verona came under the dominion of the Visconti.

SCALA NOVA, a seaport of Asia Minor, stands on an eminence at the head of a gulf of the same name, 40 m. s.e. of Samos in the vilayet of Smyrna. The ruins of the ancient city of Ephesus (q.v.) are in the vicinity. An important export trade is carried on. Pop. stated at 20,000. The gulf of Scala Nova, confined on the s. by the island of Samos, is 40 m. long and about 20 m. broad.

SCALCHI, **SOFIA**, operatic singer, b. in Turin, Italy, Nov. 29, 1850. She made her debut in Mantua, in 1866, and sang in operas throughout Europe. She has frequently visited America, where she is a favorite. Her voice is a rich contralto of extensive compass, enabling her to sing also mezzo-soprano. Her most successful parts are: *Siebel* in Gounod's *Faust*; *Fides* in Meyerbeer's *Prophète*; *Anneris* in Verdi's *Aïda*; *Arsace* in Rossini's *Semiramide*; and *Pierotto* in Donizetti's *Linda di Chamounix*.

SCALD-HEAD (a corruption probably of *scaled head*) is the popular name of a fungous parasitic disease of the scalp (and occasionally of the face and other parts) known in medical phraseology as *favus*, *tinea favosa*, and *porrigo scutulata*. The primary seat of the parasite is in the lowest portion of the hair-follicles, outside the layer of epithelium which covers the root of the hair. The plant is, however, often found in cup-shaped depressions on the surface of the scalp, forming the yellow honeycomb-like masses which suggested the specific name *favus* (honeycomb) for the disease. The honeycomb crust continues to increase, preserving its circular form and depressed center, till it occasionally reaches a diameter of nearly half an inch. These crusts commonly appear in crops, and may be either distinct or confluent. "At a more advanced stage," says Dr. Aitken, "the epidermis disappears, and a viscid fluid is secreted in such abundance as to form one entire incrustation over the entire head; hence the *porrigo larvalis*—mask or vizor-like scald-head. The smell of the scab is peculiar, and has been compared to that of the urine of a cat, or of a cage in which mice have been kept. It is probably due to a species of alcoholic fermentation in connection with the vegetable growth." The scab sometimes resembles a lupine, or a minute shield, rather than the cell of the honeycomb, and hence the varieties of scald-head which have been described under the name of *porrigo lupinosa* and *porrigo scutulata*.

The great point to be aimed at in the treatment of this affection is to destroy the cryptogamic parasite, and to eradicate its germ. For this purpose the head should be shaved, and poultices then applied till the scabs are removed. Tar-ointment should then be applied, night and morning, the old ointment being washed off with soft soap and water before the fresh dose is laid on. Dr. Aitken states, that in the early stage of the disease, in place of the preceding treatment, it is sometimes sufficient to cut the hair close, and to wash the affected parts, night and morning, with oil of turpentine. If the disease does not yield to these applications, the same treatment as that recommended for **RINGWORM** must be tried.

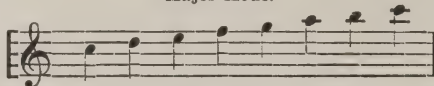
SCALDS. See **BURNS** AND **SCALDS**.

SCALE-ARMOR consisted of small plates of steel riveted together in a manner resembling the scales of a fish. From the small size of the plates, it possessed considerable pliability, and was therefore a favorite protection for the neck, in the form of a curtain hanging from the helmet. Scale-armor is now obsolete, except, perhaps, among some eastern potentates.

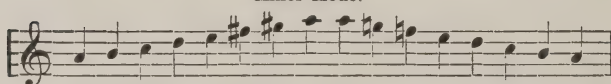
SCALE INSECT. See COCCUS.

SCALE, MUSICAL, a succession of notes arranged in the order of pitch, and comprising those sounds which may occur in a piece of music written in a given key. The ultimate criterion of what should constitute a musical scale is doubtless what gives most pleasure to a cultivated ear; but the sounds that please the ear are also found to be those that stand in certain simple mathematical relations to each other. Among the ancient Greeks, various different scales or *modes* were in use, of which six were generally enumerated—the Dorian, Phrygian, Lydian, Mixo-Lydian, Ionic, and Æolian. Excepting in the music of the Greek church and of the Ambrosian chant, modern musical feeling has rejected all of these but two, the Ionic and Æolian, the former of which is now known as the major, and the latter the minor mode. In both modes, the scale consists of a series of seven steps leading from a given note fixed on as the tonic or key-note to its octave, which may be extended indefinitely up or down, so long as the sounds continue to be musical.

Major Mode.



Minor Mode.



For an explanation of the principles on which these scales are founded, and of their adoption from the harmonic triad, see MUSIC. The major scale is derived from much simpler proportions than the minor. The minor scale requires to be modified by occasionally sharpening its sixth and seventh.

SCALES OF FISHES. They are divided by Agassiz, whose classification is generally adopted, into the *placoid*, *ganoid*, *ctenoid*, and *cycloid* forms. *Placoid* scales (from the Gr. *platē*, a broad plate) lie side by side without overlapping or imbricating. They are often elevated at the center so as to form a strong projecting point. All the cartilaginous fishes, except the sturgeon, have placoid scales. *Ganoid* scales (from the Gr. *ganos*, splendor) are covered with a fine enamel, and generally of a rhomboidal form and imbricated. The sturgeon and the bony pike (*lepidosteus*) have scales of this nature, but the finest examples of these scales are found in fossil fishes. *Ctenoid* scales (from *kteis*, a comb) are generally of a rounded or oval form, with teeth or projections on their posterior margin. They are devoid of enamel, and present an imbricated arrangement. The perch and many osseous fishes possess these scales. *Cycloid* scales (from the Gr. *kyklos*, a circle) consist of concentric layers of horn or bone, without spinous margins, and not covered by enamel. They are soft and flexible, present a variety of linear markings on their upper surface, and usually exhibit an imbricated arrangement. The carp, herring, salmon, etc., possess these scales. In many cases, two kinds of scales occur in the same fish, while in other cases the different species of a single genus exhibit different kinds of scales.

For anatomical details regarding the structure and mode of development of scales, the reader is referred to Prof. Huxley's article "Tegumentary Organs" in the *Cyclopædia of Anatomy and Physiology*, and to Prof. Williamson's memoirs in the *Philosophical Transactions*, 1849-52. In their chemical composition, the scales of fishes approximate to the bones, except that they contain more organic matter. The brilliancy of tint exhibited by many fishes is due apparently to the phenomena of optical interference, rather than to the presence of coloring matter. Figures of ctenoid and ganoid scales are given in the articles CTENOID FISHES and GANOID FISHES.

SCALES OF NOTATION are the various "radicles" which determine, as explained under notation (q.v.), the form and digits of the number expressing any numerical quantity. Thus the number 289, in the decimal or common system whose radix is 10, signifies 9 units, 8 tens, and 2 hundreds, or $2 \times 10^2 + 8 \times 10 + 9$. To express the same number in the quinary scale, for instance, we must group the 289 units into multiples and powers of 5; an operation which may be performed in either of two ways, as follows:

5)289	289	2124 (quinary)
557-4	10	5
511-2-4	108 (taking in 8, and carrying	11 (carrying by 10)
2-1-2-4	10 by 5)	5
	2124	57
		5
		289

or 2124 (i.e., $2 \times 5^3 + 1 \times 5^2 + 2 \times 5 + 4$) in the quinary scale represents the same numerical quantity as 289 in the decimal scale. The following list shows the same

numerical quantity according to the scales having for their radices the first 11 numbers after unity, and will partly indicate the advantages and disadvantages of each scale:

In the <i>binary</i>	(<i>radix</i> 2) scale	100,100,001
" <i>ternary</i>	" 3 "	101,201
" <i>quaternary</i>	" 4 "	10,201
" <i>quinary</i>	" 5 "	2,124
" <i>senary</i>	" 6 "	1,201
" <i>septenary</i>	" 7 "	562
" <i>octary</i>	" 8 "	441
" <i>nonary</i>	" 9 "	351
" <i>decimal</i>	" 10 "	289
" <i>undenary</i>	" 11 "	243
" <i>duodecimal</i>	" 12 "	201

It will be observed that the binary scale possesses only two symbols, 0 and 1, the ternary has 3, while the undenary would require a symbol in addition to the 9 digits and zero to express 10, which is a digit in that scale, and the duodecimal scale two additional symbols for 10 and 11. A glance at the above table shows at once that if the binary scale had been in ordinary use, great facility in the "performance" of arithmetical operations would have been obtained at the cost of largely increasing their "extent," and that both the advantage and disadvantage diminish as we raise the scale. The selection of "ten" as the ordinary scale is very prevalent, and was evidently suggested by the number of fingers; but the scales of two, three, four, five, six, and twenty have at various times been made use of by a few nations or tribes. The scale of twelve has long been generally employed in business among northern European nations, as is instanced by such terms as "gross," signifying 12 times 12, and "double gross," denoting 12 times 12 times 12; and it has also been largely introduced into the standard measurements of quantity, as inches, pence, ounces, troy, etc., causing a considerable amount of complexity in calculation, as all abstract numerical calculation follows the decimal system. To remedy this acknowledged evil, it has been proposed to introduce the decimal system *in toto*, as has been done in France, Italy, Russia, etc., or else to do the same with the duodecimal system. Those who hold to the first proposal have the argument of conformity in their favor; those who support the latter do so on the ground that 12 has in proportion far more aliquot parts than 10 has, and that on this account the number of fractions, and the size of each numerator and denominator, would be diminished; while both parties can bring overpowering arguments against the continuance of the present method, or rather want of method. See DECIMAL SYSTEM.

SCALIGER, JOSEPH JUSTUS, the tenth child of J. C. Scaliger and Andietta de Roques Lobejac, and much his father's superior in learning, was born in 1540 at Agen, whence, at the age of 11, he was sent, along with two of his brothers, to the college of Bordeaux, where for three years he studied Latin. A pestilence breaking out in the town, he was recalled by his father, who supplemented the scanty knowledge which his son brought home with him by making him write a Latin declamation every day upon any subject he chose. Under this training he soon attained great proficiency as a Latinist; and in his 19th year, on the death of his father, he went to Paris, where he studied Greek under the famous Turnebus. He was less indebted, however, to any master than to himself; and finding that his progress was slow under his great preceptor, he closeted himself alone with Homer, and in 21 days read him through, with the aid of a Latin translation, and committed him to memory. In less than four months he had mastered all the Greek poets. Next, Hebrew, Syriac, Persian, and the most of the modern European languages succumbed in rapid succession to his industry, while at the same time he was assiduous in his composition of verses both in Latin and Greek. About this time he boasted that he could speak 13 languages, ancient and modern; and such was his ardor in study, that he allowed himself only a few hours' sleep at night, and would frequently pass whole days without rising from his books even for meals. His proficiency in literature, especially in the history, chronology, and antiquities of Greece and Rome, secured him, in 1583, an honorable engagement from Louis de la Roche Pozay, at that time French ambassador at the pontifical court. The year before, however, he had become a Protestant, which rendered it difficult for him to retain an appointment in France. Except that he traveled a good deal, at the generous instance of his patron, and visited the chief universities of France and Germany, and even found his way to Scotland, we know little of his life between 1565 and 1593. He is conjectured to have traveled in Italy, and to have gone as far as Naples. Certain it is, however, that in the year last named he complied with an invitation of the Dutch government, and went to fill the chair of literature, vacated by Lipsius in Leyden University where he spent the residue of his days. His labor now consisted chiefly in interpreting and illustrating the classical authors. He died of dropsy on Jan. 21, 1609, and was never married. We have said that he far excelled his father in learning; but it should be added that he was not a whit less irritable, arrogant, or vain; that he fully shared the paternal pride of pedigree, spurious as he probably knew his own to be; and that he endeavored to support his father's genealogical fictions in his well-known letter to Dousa on the splendor of the Scaliger family. His writings abound with expressions of hatred and contempt toward his opponents, and he has enriched the vocabulary of learned abuse to an extent well-nigh proverbial. He

was, however, a man of immense vigor of understanding, and must be credited with having been the first to lay down in his treatise *De Emendatione Temporum* (Paris, 1583) a complete system of chronology formed upon fixed principles. It was this most learned achievement, and his invention of the Julian period, that secured for him the title of the father of chronological science. It was subjected to much emendatory criticism by censors like Petavius, and also by himself, its errors having been partly corrected by him in his later work, the *Thesaurus Temporum, complectens Eusebii Pamphili Chronicon cum Isagogicis Chronologicæ Canonibus* (Amst. 1658, 2 vols. fol.). Among the classical authors whom he criticised and annotated are Theocritus, Seneca (the tragedies), Varro, Ausonius, Catullus, Tibullus, Propertius, Manilius, and Festus. His other works are *De Tribus Sectis Judæorum*; *Dissertations on Subjects of Antiquity*; *Poemata*; *Epistolæ*; a translation into Latin of two centuries of Arabian proverbs, etc. He numbered among his friends the most illustrious scholars of the time, such as Lipsius, Casaubon, Grotius, Heinsius, the Dupuys, Saumaise, Vossius, Velser, P. Pithou; and interesting notices of him are preserved in such works as the *Huetiana*, and above all, in the two vols. of *Scaligerana*, which embody his conversations, and which were collected and published after his death. See the paper in Mark Pattison's *Essays* (1889).

SCALIGER, JULIUS CÆSAR, one of the most famous men of letters that have appeared since their revival, was born in 1484. In after-life he created for himself a noble pedigree, and made out that he was descended from the princely family of the Scalas of Verona, and that his birthplace was the castle of Riva, on the banks of the Lago di Guarda. According to his own account, he was educated first under the famous Fra Giocondo; was afterward attached as a page to the emperor Maximilian, whom he attended for 17 years in peace and war; was next made a pensioner of the duke of Ferrara; thereafter studied at Bologna; commanded a troop of cavalry at Turin under the French viceroy; prosecuted his studies there in philology, philosophy, and medicine; and in 1529 went to Agen, in France, with the bishop of that diocese, a member of the Rovere family, to whose household he became physician. Tiraboschi's account, however, which is the more probable, represents him as having been born at Padua, the son of Benedict Bordoni, who was a geographer and miniature-painter of that city, and who, either from the sign of his shop or the name of the street he lived in, assumed the surname Della Scala. Up to his 42d year, young Giulio Bordoni resided chiefly in Venice or Padua, engaging in the study and practice of medicine, and appearing under his true name as an author. In 1525 he withdrew to Agen, either from some advantageous offer, or with a view to promote his fortune, and there fixed his abode. He became physician to the bishop of the diocese, and in that capacity sought in marriage Andietta de Roques-Lobefac, a young lady only 16 years of age, and of noble and rich parentage. An obstacle was thrown in the way of this alliance; and probably with the purpose of improving his position, and lessening the disparity in station between himself and the object of his affections, he procured, in 1528, letters of naturalization as a French subject, under the name of Jules-César de Lescalle de Bordonis. This was probably the occasion when he added Cæsar to his baptismal name of Julius. The marriage took place in 1529, and was both happy and fruitful. He died in 1558 leaving behind him a mass of publications on various subjects, and a reputation for extent and depth of learning, which, considering the ripe age at which he made the majority of his acquirements, redounds to the credit of his vigorous understanding and extraordinary memory. As a thinker, he was more independent than sound; and as a man, was of violently irritable temper and excessive vanity. His best known publications are—*Commentarii in Hippocratis Librum de Insomniis* (Commentaries on the Hippocratic Treatise on Dreams); *De Causis Lingue Latine Libri XVIII.*, celebrated as the first considerable work written in the Latin language in modern times, and not without value even yet; his Latin translation of Aristotle's *History of Animals*; his *Exercitationum Exotericarum liber quintus decimus de Subtilitate ad Hieronym. Cardanum*; his seven books of *Poetics* (also in Latin, and on the whole his best work); his *Commentaries on Aristotle and Theophrastus*; his two orations against Erasmus; his Latin poems, etc. See Pattison's *Essays* (1889).

SCALLOP, more commonly *escalop* (q.v.), in heraldry, a species of shell. It has been considered the badge of a pilgrim, and a symbol of the apostle St. James the Greater, who is usually represented in the garb of a pilgrim. As to the mollusk which produces this shell, see **Pecten**.

SCALP, **THE**, is the term employed to designate the outer covering of the skull or brain-case. Except in the fact, that hair in both sexes grows more luxuriantly on the scalp than elsewhere, the skin of the scalp differs so slightly from ordinary skin that it is unnecessary to enter into any details on this point. But besides the skin, the scalp is composed of the expanded tendon of the occipito-frontal muscle, and of intermediate cellular tissue and blood-vessels. Injuries of the scalp, however slight, must be watched with great caution, "for they may be followed by erysipelas, or by inflammation and suppuration under the occipito-frontal muscle, or within the cranium, or by suppuration of the veins of the cranial bones, and general pyæmia that may easily prove fatal."—Druitt's *Surgeon's Vade Mecum*, 8th edition, p. 332. In the treatment of a wound of this region, no part of the scalp, however injured it may be, should be cut or torn away; and, if possible, the use of stitches should be avoided, as plasters and bandages

will generally suffice to keep the separated parts in apposition. The chance of suppuration may be prevented by coagulating the blood externally, by dressing the wound with lint, saturated with *friers' balsam* (*tinctura benzoin, comp.*), so as to seal up the injured part from the access of air. The patient should be confined to the house (and in severe cases to bed), should be moderately purged, and fed upon non-stimulating, but not too low diet.

Burns of the scalp are very liable to be followed by erysipelas and diffuse inflammation, but the brain is comparatively seldom affected in these cases.

Tumors of the scalp are not uncommon, the most frequent being the cutaneous cysts popularly known as *wens* (q.v.), and vascular tumors.

SCAMANDER, the ancient name of a river in the Troad (see **TROY**), which, according to Homer, was also called Xanthus (Gr. yellow) by the gods, and as a divinity took an important part in the Trojan war, its destructive floods doing serious injury to one party, and thus materially assisting the other. The Scamander rose in mount Ida (q.v.), and, flowing w. and n.w., discharged itself into the Hellespont, after being joined by the Simois, about 2 m. from its mouth: the two rivers, however, since the 1st c. A.D., have had separate courses. There has been much controversy as to what modern river corresponds to the ancient Scamander; but recent investigators have settled in favor of the Menderes.

SCAMIL LUS, a small plinth below the bases of Ionic, Corinthian, and other columns.

SCAMMONY is a gum-resin of an ashy-gray color, and rough externally, and having a resinous, splintering fracture. Few drugs are so uniformly adulterated as scammony, which, when pure, contains from 81 to 83 per cent of resin (which is the active purgative ingredient), 6 or 8 of gum, with a little starch, sand, fiber, and water. The ordinary adulterations are chalk, flour, guaiacum, resin, and gum tragacanth.

Scammony, when pure, is an excellent and trustworthy cathartic of the drastic kind, well adapted for cases of habitual constipation, and as an active purgative for children. The resin of scammony, which is extracted from the crude drug by rectified spirit, possesses the advantage of being always of a nearly uniform strength, and of being almost tasteless. The *scammony mixture*, composed of four grains of resin of scammony, triturated with two ounces of milk, until a uniform emulsion is obtained, forms an admirable purgative for young children in doses of half an ounce or more. According to Christison, "between 7 and 14 grains of resin, in the form of this emulsion, constitute a safe and effectual purgative" for adults. Another popular form for the administration of scammony is the *compound powder of scammony*, composed of scammony, jalap, and ginger, the dose for a child being from 2 to 5 grains, and for an adult from 6 to 12 grains. Scammony is frequently given surreptitiously in the form of biscuit to children troubled with thread worms.

The plant which produces this valuable drug is *convolvulus scammonia* (see **CONVOLVULUS**), a native of the Levant. It is a perennial, with a thick fleshy tapering root, 3 to 4 ft. long, and 3 to 4 in. in diameter, which sends up several smooth slender twining stems, with arrow-head shaped leaves on long stalks. The root is full of an acrid milky juice, which indeed pervades the whole plant. The scammony plant is not cultivated, but the drug is collected from it where it grows wild. The ordinary mode of collecting scammony is by laying bare the upper part of the root, making incisions, and placing shells or small vessels to receive the juice as it flows, which soon dries and hardens in the air.

The name *French* or *Monpellier scammony* is given to a substance which is prepared in the s. of France, chiefly from the juice of *cynanchum monspeliacum*, a plant of the natural order *asclepiaceæ*. It is a violent purgative.

SCANDALUM MAGNATUM. This offense was committed in speaking words in derogation of a peer, judge, or great officer of the realm, and a special action was brought for such words, the punishment being damages and imprisonment. But now this proceeding, though not expressly abolished, is superseded by the ample remedies of criminal information (q.v.), indictment, or action. A somewhat similar offense in Scotland is called leasing-making (q.v.).

SCANDERBEG (properly, *Iskander-beg*, "the prince Alexander," the name given him by the Turks), the famous patriot chief of Epirus, was b. in that country in 1403. His real name was George Castriota, and his father, John Castriota, was one of the great lords of Epirus, his mother, Voisava, being a Servian princess. In 1423, he was given as one of the hostages for the obedience of the Albanian chiefs, and his physical beauty and intelligence so pleased Amurath II., that he was lodged in the royal palace, and subsequently circumcised and brought up in Islamism, being also put under the tuition of skillful masters in the Turkish, Arabic, Slave, and Italian languages. In 1433, he greatly distinguished himself in Asia as a Turkish pasha (of one tail); but being offended at the confiscation of his paternal domains, and being solicited by some Epirote friends to return to his native country to aid in the restoration of its independence, he watched an opportunity of withdrawing from the Turkish army. He had not long to wait, for the generous and unsuspicious sultan, who had caused him to be brought up as if he had been his own son, gave him the command of a large division of the army which was destined to act against the Hungarian invaders. Scanderbeg, having concerted his plans

with 300 of his fellow-countrymen in the Turkish army, deserted during the confusion of the first battle (1443), and having previously compelled Amurath's secretary (whom he afterward murdered to avoid detection) to prepare an order investing him with the government of Croia (now *Ak-hissar*), the capital of Epirus, he and his companions fled thither with all possible speed. The unsuspecting governor at once resigned the town into his hands, and was massacred along with the garrison. At the news of Scanderbeg's success, the whole country rose in insurrection, and in 30 days he had driven every Turk, except the garrison of Sfetigrad, out of the country. In order to strengthen himself in his new position, he invited a number of the neighboring princes and Albanian chiefs to a conference, at which it was unanimously agreed to make no terms with the Turks, and to obey Scanderbeg implicitly as their leader. Scanderbeg then raised an army of 15,000 men, with which he completely scattered (1444) the 40,000 Turks whom the indignant sultan had sent against him, killing an immense number of them, and taking a few prisoners. Three other Turkish armies shared the same fate, and the "animus" with which the contest was carried on may be imagined, when we consider that the number of prisoners taken in the last (1448) of these three battles amounted to *seventy-two*. Amurath himself in 1449 took the field, and stormed many of the principal fortresses, but being then ill of his fatal malady, he retired from before Croia, to die at Adrianople (1450). Scanderbeg's splendid successes brought in congratulations from the pope and the sovereigns of Italy and Aragon, but many of the Epirote chiefs were becoming wearied of the continual strife, and fell off from him, some of them even joining the Turks. Scanderbeg's career was now, in consequence, of a more checkered character, but in spite of occasional defeats, he stoutly refused all the liberal and fair proposals of the sultan, Mohammed II., who had a profound admiration for him, and sheltered by the mountainous nature of the country, carried on an unceasing warfare. At last an armed convention was agreed to in 1461, and Scanderbeg profited by this leisure to pay off his debt to the pope and the king of Aragon (both of whom had supplied him with material assistance during his greatest need), and crossing over to Italy, he routed the partisans of Anjou, and restored the kingdom of Naples to the latter of his benefactors, returning home laden with honors and benedictions. At the instigation of the pope, who had tried in vain to raise the other Christian princes of Europe against the Turks, Scanderbeg broke the armed truce in 1464, and repeatedly defeated the Turks; but Mohammed becoming furious at these unprovoked aggressions, equipped two mighty armies, the first of which invested Croia, the second, under his own leadership, advanced more leisurely. The first army was, after a desperate contest, defeated by Scanderbeg in 1466; but the restless and indomitable chief, worn out with the incessant toil of 24 years, died at Alisso, Jan. 17, 1468. The war continued to rage some time longer, but the great mainstay of the country was now wanting, and before the end of 1478, the Turkish standard floated undisturbed over Epirus. Barlesio, a fellow-countryman of Scanderbeg, who has written his biography (*De Vita et Moribus ac rebus gestis Geo. Castrioti*, Rome, 1537), remarks his sobriety, the purity of his manners, and the strictness of his religious belief. He had vanquished the Turks in 22 pitched battles.

SCANDINAVIA, a large peninsula in the n. of Europe, bounded on the n. by the Arctic ocean; on the w. by the Atlantic, North Sea, Skager Rack, Cattegat, and Sound; and on the s. and e. by the Baltic sea, gulf of Bothnia and Finland, with which it is connected on the n.e. by an isthmus 325 m. wide. This peninsula comprises the two kingdoms, Norway (q.v.) and Sweden (q.v.); is 1240 m. long, from 230 to 460 m. broad, area 300,000 sq. m. The ridge of mountains which traverses the peninsula in the direction of its length gives character to the whole conformation. The western division of the Scandinavian peninsula is covered with mountains; the eastern half, Sweden, consists principally of low-lying country. The mountains of Scandinavia extend from Waranger Fiord, in the extreme n.e., to the promontory of the Naze, in the extreme s.w., with an average breadth of 180 miles. They consist principally of gneiss and micaceous schist, sometimes, but rarely, of porphyry, syenite, granite, and chalk; salt is not found; silver, copper, and iron abound. The Scandinavian mountains, though forming in reality one great range, are considered as forming four sections—the Lapland mountains, in the n., from 1000 to 2,060 ft. high; the Kjolen mountains, from 1500 to 2,575 ft. high; the Dovre Fjelde, from 2,500 to 3,600 ft. high; and lastly, the Southern Fjelde, 4,000 to 5,150 ft. high. Though of inconsiderable height, yet the numerous glaciers and snow-fields of the mountains of Scandinavia impart to this range almost an Alpine character. The climate of Scandinavia is much milder on the w. than on the e. side, a fact to be ascribed probably to the influence of the Gulf stream. The character of the country, its physical features, industries, etc., are given under the articles **NORWAY** and **SWEDEN**.

The ancient *Scandia*, or Scandinavia, included northern Denmark, as well as the peninsula that still retains the name. It is first mentioned by Pliny, who, unaware that the peninsula was attached to Finland on the n. considered Scandinavia as an island.

SCANDINAVIAN LANGUAGE AND LITERATURE. The language which was spoken during the heathen ages in all the northern or Scandinavian lands, and which, in accordance with traditionary belief, had been introduced by Odin and his companions, when the Gothic tribes supplanted the more ancient races of the Finns and Lapps, is always referred to by the oldest authorities either as the *Dönsk tunga*, "Danish tongue," or as the

Norræna, "Norse." We never hear of the "Swedish" or "Gothic tongue," and although different dialects no doubt existed, from an early period, among the Scandinavian people, it is certain that substantially the same language was spoken by the Northmen generally till the 11th century. According to recent inquiries, the race of the Northmen, before their settlement in Sweden and Norway, was divided into an eastern and western branch, the former of which is supposed to have used the old language of Norway and Iceland, and the latter the Swedish and Danish dialects. These two divisions of the race had entered Scandinavia by different routes, the eastern having passed along the gulf of Bothnia, through the country of the Finns and Lapps, while the western branch had crossed from Russia to the Åland islands, and spread from thence southward and westward; and it seems natural to infer that in their respective lines of migration they may have incorporated into their own speech some of the special characteristics that belonged to the language of the peoples with whom they come in contact. But the differences thus introduced could not have been important, for we find the same language employed in the several most ancient laws of the different people of Scandinavia, while the two Eddas (q. v.)—the oldest monuments of Scandinavian speech—which were compiled in Iceland, whither the Northmen had carried their language on their settlement in the island in the 9th c., give evidence of an almost complete identity of local and personal names. This unity of language is further proved by the agreement which is found to exist in all runic inscriptions, from Sleswick to the northern parts of Sweden, and from Zealand to the western shores of Iceland. All monuments of this old Northern tongue would, however, have been lost to us, had not the *Norræna* or Norwegian form of it been carefully preserved and cultivated in Iceland through the short songs (*hjóð* or *quida*) relating to the deeds of the gods and heroes of the north, which had existed as early probably as the 7th c., and had passed with the religion and usages of Norway to the new colony. After the introduction of Christianity into Iceland in the year 1000, schools were founded there, classic literature was cultivated, and Roman characters were adopted for the writing of the national tongue, but this did not interfere with the zeal with which the national laws and poems were collected and studied by native scholars. This literary activity continued unabated till the 13th c., when the republic of Iceland, after having long been distracted by the dissensions of the rival aristocratic families of the island, was conquered by Hakon VI., king of Norway. Since 1380, Iceland has formed part of the Danish dominions, and although since that period the colonists have partly succumbed to the cramping influences of the subordinate and dependent conditions in which they have been placed; the distance from the mother-country, and the tenacity with which the people cling to all memorials of their former history, have enabled them to preserve their language so unchanged, that the Icelander of the present day can read the sagas of a thousand years since, and still writes in the same phraseology that his forefathers used ages ago. But while the old Scandinavian tongue was thus preserved in the far-distant colony, it had undergone great changes in Norway; and when, by the union of Calmar in 1380, the latter country was united to Denmark, the Danish form of speech, that had in the meanwhile been changing under the modifying influences due to the introduction of Latin and to contact with other nations, supplanted the Norwegian language, which thenceforth being banished from the pulpit, the law courts, and from literature, split up into numerous dialects peculiar to special valleys and fjords, but unknown in the larger towns.

When we come to examine the Icelandic or ancient Scandinavian, which is closely allied to its sister Teutonic languages, and like them betrays its eastern origin, we find that it differs from the latter in several important points. It has this striking peculiarity, that the definite article, instead of coming before the noun, is appended as a termination to the end of the word. The adjective, moreover, which in its indefinite form is subject to inflections, for all genders and cases, undergoes, when in its definite form, fewer and slighter changes. Again, while in the German tongues the verb in the infinitive ends in a consonant, in the old Scandinavian it invariably terminates in a vowel. The old Scandinavian language has a passive form of the verb unknown to its Gothic sister tongues; and while in German the third person of the present tense differs from the second person, such is not the case in Old Northern. In the latter, the vowel sounds are greatly modified by a very perfect system of combinations, indicated by dots or accents; and in addition to the consonants of the Gothic languages, it has an aspirated *d* and *t*. It possesses, moreover, a flexibility and richness of construction, which admit of favorable comparison with those of the ancient classical languages, while in regard to the number and comprehensiveness of its words, and its consequent independence of foreign derivatives, it presents a character of regularity and unity which is wanting to the other Germanic languages. Its mode of construction is simple in prose, and in the earlier forms of poetry, although in the latter periods of the *skalds* (q. v.) it degenerated into a state of artificial complexity. The chief feature of the metrical system employed in Old Northern poetry was alliteration (q. v.). The alliterative method was continued after the introduction of terminal rhyme, but the simplicity of the ancient lay gave way in the 10th c. to the most artificial complexity of versification in the meters invented by the *skalds*. Besides these skaldic measures, of which 106 are enumerated in the *Hattalykli*, or Key of Meters, drawn up in the 13th c. by the Icelander, Snorri Sturlesson (q. v.), the *skalds* were required to know the *Kenningar*, or poetic synonyms, of which there

were an enormous number; some words, as Odin, island, etc., having upward of 100. The main feature of the system was that nothing must be called by its right name: thus a ship was a beast of the sea, a serpent of the waters, a dragon of the ocean, etc.; a woman was a graceful tree, a fair pearl, etc.; a wife was a husband's *Rune* (q.v.), or his confidential and intimate friend, etc.

The fragments of old northern poetry that have come down to us in the *Eddas* belong for the most part to the 8th c., or even perhaps to the 7th c.; and consist of short songs (*hljóð* or *quida*), which are either mystic, didactic, mythic, or mytho-historic in their character. See *EDDA*. It is supposed that some of these compositions, and several of the poems which celebrate the adventures of the gods, giants, and elves, were composed prior to the immigration into Scandinavia of Odin and his followers; while, on the other hand, the local coloring of others sufficiently prove their northern origin. In addition to the subjects belonging to the Odinic mythology, we have in the mytho-historic lays, known as the songs of the famous Smith *Völundr*, or the *Völundar-quida*, a cycle of heroic poems similar to the old German epic the *Nibelungenlied* (q.v.); but much more ancient in form than that in which the latter has reached us. In the 9th and 10th centuries the ancient epic and the simple songs of the older poets gave place to the artificial poetry of the skalds, which, from its earliest development, manifested a realistic tendency, and made the real adventures of living men the subject of their compositions. Many of these compositions, as the *Eiríksmál*, or the Death and Apotheosis of King Eric Bloodaxe, who died in 952; the *Hakonar-mál*, or Fall of Hakon the Good; and several poems by the famous Icelandic skald Egill Skallagrímson, while they afford valuable materials for the early history of the north, are among the latest of the skaldic productions that preceded the more degenerate periods of the art. To the 11th and 12th centuries belong the poems known as *Gróngaldr* and *Solar-ljóð*, which were composed in imitation of the ancient compositions, and consist of moral and didactic maxims, the former conceived from an assumed heathen, and the latter from a Christian point of view. In the 13th c. the skaldic art thoroughly declined, and gave place, in Iceland, to a puerile literature, based upon biblical stories and saints' legends. In Scandinavia proper, a more modern form of national literature was in the meanwhile being gradually developed by means of oral transmission, whence arose the folk-lore and popular songs of Norway and Sweden, and the noble Danish ballads known as the *Kæmpe viser*, whose composition in the old northern or Icelandic tongue may probably be referred to the 14th century. The earliest Icelandic prose belongs to the beginning of the 12th c., when Ari "hinns Frode," or the wise, composed a history of his native island and its population in the *Íslendinga-bók* and *Landnáma-bók*, the latter of which was continued by others. He was the first northern writer who attempted to assign fixed dates to events by reference to a definite chronology, and his work is remarkable as the earliest historical composition written in the old Danish or Norse, as it still remains in the living language of Iceland. These works, which have since perished, entered largely into the composition of the annals of the early kings of Norway, compiled a century later by Snorri Sturluson under the title of the *Heimskringla*. Throughout the middle ages the literature of Iceland was enriched with numerous national and other sagas, the materials of which were drawn from skaldic songs, folk-lore, local traditions, and family histories; and in its later stages of development included among its subjects the mythic cycle of Arthur and his knights, Merlin, Alexander, Charlemagne, etc. The compilation of the laws of the island attracted the attention of the Icelanders at an early period; and in 1118 a complete code, known as the *Gragas*, which had been derived from the ancient Norse law, was submitted to the allthing or popular assembly, and a few years later the canons of the church, or the *Kristinnrettr*, were settled and reduced to writing. A collection of those enactments in the ancient and subsequent codes, which are still in force in Iceland, has been made by Stephensen and Sigurdsson (Copen. 1853), under the title of *Lagasafn handa Íslandi*; while the ancient Norse laws, beginning with the *Gulathingss-lög* and the *Hirdskera* of Hakon the good, which date from the 10th c., have been ably and critically edited in Norway under the title of *Norges gamle Love* (Christ. 1846-49). The study of the old northern language and literature, which was successfully inaugurated by the native scholars of Iceland in the 17th c., was soon prosecuted with equally happy results in Denmark and Sweden, and within the last 20 years in Norway, where the subject forms a necessary introduction to the investigation of the language and history of the country. Copenhagen has, however, in recent times, been the principal seat of these inquiries, the successful prosecution of which has been materially facilitated by the large number of important Icelandic MSS. contained in its libraries, and by the foundation of the Arne-Magnussen collection in 1772; and the different societies especially designed to promote the study of Icelandic and of northern antiquarian monuments. Among the Icelandic and Danish scholars who have gained pre-eminent distinction in these departments of research, we may instance Arne-Magnussen, Torfæus, Olavsen, Finn Magnussen, Worm, Resenius, Bartholin, Thorlacius, Müller, Rask, Rafn, Keyser, Munch, Unger, Lange, etc. In the study of the grammar and comparative structure of the language, which excited an interest as early as the 13th c., as is proved by the grammatical treatises and rules of prosody incorporated in the younger *Edda*, no one has evinced a higher order of scientific acumen and critical learning than Rask (q.v.), who in his erudite work *Om det gamle Nordiske Sprogs Oprindelse* (Kjøbenh. 1818) threw a flood

of new and important light on the subject; while the labors of Jakob Grimm, Munch, and others, have tended materially to exhibit the affinities between the old northern and the Teutonic languages, and to assign to it its right position among the kindred Indo-Germanic tongues. See F. W. Horn's *Literature*, and the *Corpus Poeticum Boreale*, 1883.

SCANDINAVIAN MYTHOLOGY. Our knowledge of Scandinavian mythology is mainly derived from the collections of ancient northern sagas known as the Eddas (q. v.), which constitute the Odinic bible, as it were, of heathen Scandinavia. The value and interest attaching to these records of the ancient faith of the Northmen are enhanced by the fact that there are strong grounds for assuming that the closest affinity, if not identity, of character existed between their religious doctrines and practices and those of the Germanic nations generally. Hence, in the absence of anything beyond the incidental notices of the pagan religion of Germany, which are contained in the classic writers, the Eddaic exposition of northern mythology is of the highest importance to the student of the history of every nation of Teutonic origin. Owing to the remote situation of the Scandinavian lands, and the hold which the Odin religion had taken of the minds of the Northmen—whose natural tendencies inclined more to the pagan merits of valor, courageous endurance of hardships, indomitable resolution, and unflinching fidelity in hate and love, than to the Christian virtues of submission, meekness, and forgiveness of injuries—Christianity took root slowly and insecurely in those lands, and only long after a national literature, based upon the superstitions and memorials of the ancient faith, had been firmly established among the people. But although there is every reason to believe that all branches of the great Indo-Germanic family of nations had essentially the same system of belief and worship, and venerated the same deities, minor differences were numerous. Thus, for instance, while Danes, Saxons, and Gothlanders worshiped Odin as their chief god, the Swedes generally paid supreme honors to Frey, the god of the year; some tribes of northern Germany regarded Hlodyn, or the earth, as their principal deity; and the Norwegians directed their worship to Odin's son, Thor; while in some parts of Norway even, as in Halgoland, the people worshiped deities not honored elsewhere in Scandinavia. Thus the chief objects of worship in the latter district were Thorgerd, Horgabrud, and Irpa, the daughters of Halogi, or high flame, from whom the name of the country was derived, and who was probably identical with Loki (fire), who, after having, according to the myth, been beneficent in the beginning of time and united with the All-father, fell from his high estate, and, like some fallen angel, became crafty, evil, and destructive as a desolating flame. Halgoland appears from remains discovered there to have been a special seat of fire or sun worship, which seems to have been nearly universal at one period of the world's history.

Leaving for the present the discussion of the sources from whence the northern mythology derived some of the numerous complex elements which entered into its composition, we proceed to give a short summary of its cosmogony: In the beginning of time a world existed in the n. called Niflheim, in the middle of which was a well, Hvergelmeer, from which sprang twelve rivers. In the s. was another world, Muspelheim, a light, warm, radiant world, the boundary of which was guarded by Surt with a flaming sword. Cold and heat contended together. From Niflheim flowed venomous, cold streams called Elivæger, which, hardening into ice, formed one icy layer upon the other within the abyss of abysses that faced the n., and was known as the Ginnunga-gap. From the s. streamed forth the sparkling heat of Muspelheim; and as heat met cold, the melting ice-drops became instinct with life, and produced, through the power of him who had sent forth heat, a human being, Ymir, the progenitor of the frost-giants, by whom he was called Egelmer, or chaos. He was not a god, but evil, both he and all his race. As yet there was neither heaven nor earth, neither land nor sea, but only the abyss Ginnunga-gap. Ymir drew his nourishment from the four milky streams which flowed from the udders of the cow Audhumla, a creature formed from the melting frost. From Ymir there came forth offspring while he slept—a man and woman growing from under his left arm, and sons from his feet; and thus was generated the race of the frost-giants, or Hrimthursar, among whom the All-father dwelt in the beginning of time before the heavens and the earth were created.

In the meanwhile, as the cow Audhumla licked the frost-covered stones, there came forth the first day a man's hair, the second day a head, and the third day an entire man. This man, *Buri*, or the producing, had a son *Bör* (the produced), who married Beltsa, one of the giant race, by whom he had three sons, Odin, Vili, and Ve.

These three brothers, who were gods, slew Ymir, and carrying his body into the middle of Ginnunga-gap, formed from it the earth and the heavens. Of his blood they made all seas and waters, taking the gore that flowed from his body to form the impassable ocean which encircles the earth; of his bones they made the mountains, using the broken splinters and his teeth for the stones and pebbles; of his skull they formed the heavens, at each of the four corners of which stood a dwarf, viz., Austri at the e., Vestri at the w., Northri at the n., and Suthri at the south. Of his brains they formed the heavy clouds, of his hair plants and herbs of every kind, and of his eyebrows they made a wall of defense against the giants round Midgard, the central garden or dwelling-place for the sons of men. Then the three brothers took the glowing sparks that were thrown out of the world Muspelheim, and casting them over the face of heaven, raised

up the sun, moon, stars, and fiery meteors, and appointed to each its place and allotted course; and thus arose days, months, and years.

Night was of the race of the giants, and in turn married three husbands, by one of whom she had a daughter, Earth, and by another a son, Day, who was bright and beautiful like the gods, or *Æsir*, to whose race his father *Delling* belonged. To this mother and son, who were akin to the opposite races of the frost-giants and the gods, *All-fader* committed chariots and horses, and placed them in heaven, where *Night* rides first through her twenty-four hours' course round the earth with her horse *Hrimfaxi*, from whose bit fall the rime-drops that each morning bedew the face of the earth. Close after her comes her fair son *Day*, with his horse *Skinfaxi*, from whose shining mane light beams over heaven and earth. All the maidens of giant race were not dark like *Night*, for to *Mundilfori* were born a son and daughter of such beauty that their father gave to them the names of *Mani* or *Moon*, and *Sol* or *Sun*. The gods, incensed at this presumption, took them up to heaven, and ordained that they should direct the course of the sun and moon, which had been made to give light to the world, and thenceforth *Sol* drove the chariot of the sun, which was drawn by two horses, *Arvakur* (the watchful) and *Alsvith* (the rapid), under whose shoulders the gods in pity placed an ice-cool breeze. A shield named *Svalin* (the cooling) was also by their care attached to the front of the car to save sea and land from being set on fire. *Mani* directs the course of the moon, and he, like his sister, is followed by a wolf that seems about to devour him; and in the end of time this animal, which is of giant race, will with his kindred swallow up the moon, darken the brightness of the sun, let loose the howling winds, and sate himself with the blood of all dying men.

When heaven and earth were thus formed, and all things arranged in their due order, the chief gods or *Æsir*, of whom there were 12, met in the middle of their city *Asgard*, which lay on the plain of *Ida*. These gods were *Odin*, or *All-father*, who has 12 names in *Asgard* besides many others on earth; *Thor*, *Balder*, *Tyr*, *Bragi*, *Heimdall*, *Hod*, *Vidar* and *Vali* his sons, and *Njord*, *Frey*, *Ull*, and *Forsetti*. Here they raised for themselves a court with a high seat for *All-fader*; a lofty hall for the goddesses; and a smithy, in which they worked in metal, stone, and wood, but chiefly in gold, of which precious substance all the implements which they used were made, and hence this period of their existence was known as the golden age.

This age of peaceful labor lasted till three beautiful but evil maidens made their way from the giants' world, *Jotunheim*, to *Asgard*, when confusion and ill-will arose in the world. Then the gods, taking counsel, determined to create new beings to people the universe, and first they gave human bodies and understanding to the dwarfs, who had been generated like maggots within the dead body of *Ymir*, but who now took up their abodes in the bowels of the earth, in rocks and stones, and in trees and flowers. Then *Odin*, with two companions, *Hænir* and *Lodur*, went forth on an excursion to the earth, where, finding two trees, *Ask* and *Embla*, created a man and a woman of them, *Odin* giving them spirit or the breath of life, *Hænir* sense and motion, and *Lodur* blood and a fair color, with sight, speech, and hearing; and from this pair, whose dwelling was in *Midgard*, the human race has sprung. A bridge of three colors, *Bifrost*, known to men as the rainbow, connects *Midgard* with *Asgard*, and over this the gods ride daily on their horses to the sacred fountain of *Urd*, where they sit in judgment. This fountain lies at one of the three roots of the ash, *Yggdrasil*, whose branches spread over the whole world and tower above the heavens. Under one of these roots is the abode of *Hel* (q.v.), the goddess of the dead, under another, that of the frost-giants, while under the third is the dwelling of human beings. Below the tree lies the serpent *Nidhogg*, who is constantly gnawing the roots, and striving with his numerous brood of lesser serpents to undermine *Yggdrasil*, whose branches are as constantly refreshed by water from the well of *Urd*, which is poured over them by the *Norns*. These are three maidens known as *Urd*, *Verdandi*, and *Skuld* (or *Past*, *Present*, and *Future*), who dwell in a fair hall below the ash-tree, where they grave on a shield the destiny which they determine for the children of men.

Besides gods, frost-giants, dwarfs, and men, there were other beings, as the *Vanir*, who dwelt in the world *vanaheim*, lying between the abodes of the gods and of men, and the light elves and dark elves, the former of whom were friendly to mankind, and of great beauty, while the latter were of evil, demoniacal natures, and blacker than pitch.

Now, after the three giant maidens came to *Asaborg*, dissensions soon broke out among these different races, and *Odin*, by casting a spear among mankind, created war and discord in the world. Then his maidens, the *Valkyriur* (or choosers of the doomed), surrounded by lightnings, rode forth with bloody corselets and radiant spears, to choose on every battle-field those who should fall, and to lead them into *Valhal*, where the chosen heroes, known as *einheriar*, daily go forth to fight and slay one another, but returning at early morn sound and fresh, recruit themselves for the next night's combats by drinking beer with the gods and eating the flesh of the sacred hog. It is, however, only men of rank, as *jarls* (or earls), who enter *Odin's* hall after death, for the base-born, or thralls, belong to *Odin's* powerful son, *Thor* (q.v.), who rules over *Thrudheim*, and drives through the world in a chariot drawn by he-goats, bearing with

him his magic hammer Mjolnir, the iron gloves which he requires to grasp the haft, and his belt of power.

Among the gods there reigned good-will and happiness even after the rest of the world had been disturbed by war, until Loki, or the impersonation of evil, who in infancy had been Odin's foster-brother, was admitted into Asaborg as their equal. By his treachery Balder (q.v.), the purest, most beautiful, and best loved of Odin's sons, was slain. The gods, indeed, had power to inflict temporary punishment on Loki, and to chain him under a hot sulphur spring, where he lay for ages, but at length a time will come when Loki's evil progeny will prevail over the gods and the world. This terrible age of destruction, the *ragnarök*, or twilight of the gods, will be marked by a three years' winter of hard frost, cutting winds, and sunless air uncheered by summer or spring-tide, when there will be bloodshed throughout the world, brothers will slay one another, parents and children will be at war. The wolf Fenrir will break loose, the sea will burst its bounds as the serpent Jormundgard, encircling Midgard, writhes in fierce rage, and struggles to reach the land. The wolf Sköll, will swallow up the sun, and when the world is plunged in almost total darkness, his brother Hati will devour the moon, while the stars will vanish from heaven. As Midgard's serpent and the wolf Fenrir go forth, scattering venom through air and water, the heavens will be rent asunder; the ship Naglfar, which is made of dead men's nails, will be floated on the waters; the *Æsir* will ride forth across the bridge Bifrost, which will break away behind them; and all the friends of Hel, led on by Loki, will offer battle to the gods on Vigrid's plain. Then Odin, having taken counsel at Mimir's well, will advance armed with his spear Gungnir against the wolf Fenrir, while Thor encounters Midgard's serpent, and is killed by the venom which it exhales from its mouth. Although Fenrir, the wolf, will swallow Odin, and thus cause his death, he will himself be slain by the god Vidar, while Loki will fall beneath the hand of Heimdal, the watchman of the gods, and Surt, hurling fire from his hand, will burn up the whole world. After the conflagration of heaven and earth and the whole universe, there will still be dwellings for the evil and the good, the worst of which is Nastrond, a horrible habitation for perjurers and murderers, where serpent-heads pouring forth venom line the walls, while in Gimli, Odin's best heaven, the good and virtuous will find a happy resting-place.

But from the great destruction of the universe, another earth, verdant and fresh, will arise from the deep waters of the ocean, the unsown fields will bear fruits, and all evil will cease; Balder and other gods will then return to Ida's plain, where Asgard once stood, and taking counsel together, will find the golden tablets which their race had possessed at the beginning of time, and remembering their deeds of old, will await the coming of the mighty All-father, the ruler of all things, who will pronounce judgments, and establish peace that shall endure to the end of time. See *Æsir*.

The above brief epitome of the Odin cosmogony serves as a framework for the numerous beautiful prose and poetic myths which make up the substance of northern mythology; and are contained in a rich mass of sagas, not all complete in themselves, but each capable of throwing some light on the others.

Many theories have been advanced to explain the origin and the fundamental ideas on which the northern myths have been based; and while some expositors have seen in them a mere re-clothing of Bible narratives, and a perversion of Christian truths, and have referred their composition to monks living in the middle ages, others, feeling that their title to antiquity could not be set aside, have gone to the other extreme, and tried to prove that they reflected the truths of Christianity, and represented under active and tangible forms the mysteries of revelation; and that thus, for instance, in the narrative of Thor crushing the serpent we have a figurative delineation of Christ. Other interpreters, again, have attached very different meanings to these myths, regarding them as historic, psychical, physical, or even chemical; but against each of these assumed modes of explanation, taken in their full integrity, conclusive arguments might be adduced; and all that can be safely accepted is, that they are partly historical and partly an impersonation of the active forces of nature. Like the northern languages, their original seat was in the south and east, where kindred mythologies existed among the ancient tribes of India and Persia; and it is probable that the more practical and energetic spirit of the northern myths, and the more warlike character of the gods of the north, when compared with the reflective and contemplative nature of their oriental prototypes, may be due to the gradual effect on the minds of a people who had passed from the soft, enervating influences of a southern climate to the stern rigors of the north, where man lived in constant warfare with the elements and with his fellow-men. According to Snorri Sturlesson (q.v.), whose opinion seems to a certain extent to have been a mere re-echo of the traditional belief of his forefathers, Odin and his sons and companions were earthly kings and priests of a sacerdotal caste, who had migrated from Asia—perhaps, as some conjectured, from Troy—and who conquered and ruled over various parts of Scandinavia and northern Germany, where, after their death, they were regarded by the people as deities. In conjunction with this mode of representation, the mythic tales of the warfare of the gods with giants, their intercourse with dwarfs, and spirits of the air and water, and their wanderings on earth, are interpreted as memorials of real war with pre-existing races, and of the spread of Odin's religion from its chief seat in Sweden

over the neighboring countries. This theory explains only a few of the myths; while some, as we have already observed, may be referred to traces of an older faith, which lingered among the Finns and Lapps after the advance of the more civilized conquering races had driven those tribes from the southern districts of Scandinavia, which they originally occupied, to the barren recesses of the north.

The worship of the gods was celebrated either in spacious temples, of which there were many in different parts of Scandinavia, or on stone heaps or altars, known as *horg*. These altars were always near some well, and close to a sacred grove, or a solitary tree, on which the votive offerings were suspended, after they had been washed at the neighboring spring by the attendant priestesses, known as *horgabrudar*. Human sacrifices, although never resorted to on ordinary occasions, were not uncommon in times of public calamity, arising from war, failure of crops, disease, etc.; and the horse, whose flesh was highly esteemed, was a frequent victim, while the fruits of the earth and spoils of war were the usual offerings. Three great festivals were held every year, the first of which was celebrated at the new year in the Yule month, when Thorablot, or the sacrifice of Thorri, an ancient god of the Finns and Lapps, was offered. On these occasions, offerings were made to Odin for success in war, and to Frey for a fruitful year, the chief victim being a hog, which was sacred to the latter god, on the assumption that swine first taught mankind to plow the earth. Feastings and Yule games occupied the whole of the month, whence it was also called the merry month. The second festival was in mid-winter, and the third in spring, when Odin was chiefly invoked for prosperity and victory on the Vikings, or sea-roving expeditions which were then entered upon. On the introduction of Christianity, the people were the more ready to conform to the great church festivals of Christmas and easter, from the fact of their corresponding with the ancient national sacrificial feasts; and so deep-rooted was the adhesion to the faith of Odin in the north, that the early Christian teachers, unable to eradicate the old ideas, were driven to the expedient of trying to give them a coloring of Christianity. Thus the black elves, giants, evil subterranean sprites, and dwarfs, with which the Northmen peopled earth, air, and water, were declared by them to be fallen angels or devils, and under their latter character suffered to retain their old denominations. Belief in these imaginary beings survived the spread of the Reformation, and can scarcely be said to have died out in Scandinavian lands among the superstitious and ignorant, while among the more enlightened the myths connected with them are still related, and serve to give a poetic interest to special localities.

Our own association with the Scandinavian mythology is perpetuated in numerous superstitions and usages still lingering among us, and in the names of the days of the week. See WEEK.

The best northern authorities on Scandinavian mythology are N. M. Petersen, *Danmarks Historie i Hedenold* (1837); Rask, in his edition of *Sæmund's Edda*; Jakob Grimm; *Deutsche Mythologie*; Faye, *Norske-Folke-Sang*; Thorpe, *Northern Mythology* (Lond. 1851). Simrock's *Handbuch*, 1874; works of Munch and Keyser, etc

SCANTLING, the sectional breadth and thickness of timbers for roofs, floors, etc. The term is also applied to quarterings or pieces of timber of about 5 in. in thickness and under.

SCAPE GOAT. See AZAZEL.

SCAPHOID BONE (Gr. *skaphe*, a boat), a term applied to two somewhat boat-like bones, of which one occurs in the carpus or wrist (see HAND), and the other in the tarsus of the foot (q. v.).

SCAPPLE, a kind of work applied to masonry. To scapple a stone is to work the surface even without making it smooth.

SCAP'ULA. THE, or SHOULDER BLADE, is a flat triangular bone, which, when the arm hangs loosely down, extends posteriorly and laterally from the first to about the seventh rib. It presents for examination an outer convex and an inner, smooth, and concave surface, three borders (a superior, an inferior or axillary, and a posterior), three angles, and certain outstanding processes.

It is divided into two unequal parts, the supra-spinous fossa, and the infra-spinous fossa, by the spine, a crest of bone commencing at a smooth triangular surface on the posterior border, and running across toward the upper part of the neck of the scapula, after which it alters its direction, and projects forward so as to form a lofty arch, known as the acromion process, which overhangs the glenoid cavity, or receptacle for the head of the humerus or main bone of the arm. This acromion (so called from the Greek words *aeros* *ōmos*, the summit of the shoulder) obviously serves to protect the shoulder joint, as well as to give great leverage to the deltoid muscle which raises the arm. It is this process which gives to the shoulder its natural roundness. From the upper part of the neck there proceeds a remarkable curved projection, termed the coracoid process, from its supposed resemblance to the beak of a raven (Gr. *kōraz*). It is about 2 in. long, and gives attachments to several muscles. The upper border of the scapula presents a very remarkable notch, which in the recent state is bridged over with a ligament, and gives passage to the supra-scapular nerve. This bone articulates with the clavicle and

humerus, and gives attachment to no less than 16 muscles, many of which, as the biceps, triceps, deltoid, serratus magnus, are very powerful and important.

The uses of this bone may be stated as follows: 1. It connects the upper extremity to the trunk, and participates in and is subservient to many of the movements enjoyed by the arm; 2. By its extended flat surface it furnishes a lateral protection to the chest; and 3. It affords attachments to various muscles which modify the size of the thoracic cavity, and is thus concerned in the process of respiration.

SCAPULAR, or **SCAPULARY** (Lat. *scapula*, the shoulder), a portion of the monastic habit, so called from its being worn upon the shoulders. It consists of a long stripe of serge or stuff, the center of which passes over the head, one flap hanging down in front, the other upon the back. The scapular of the professed monks in most orders reaches to the feet, that of the lay brothers only to the knees. The color differs for different religious orders or congregations. Besides the scapular worn by the members of religious orders strictly so called, there exists also in the Roman Catholic church a religious association or confraternity, the members of which, while living in the world and mixing in ordinary life, wear, although not conspicuously, a small religious emblem called a scapular. The chief duties of this confraternity consist in the recitation of certain prayers, or the observance of certain religious or ascetical exercises through devotion to the Blessed Virgin. The members may or may not bind themselves by a vow of chastity. This pious association was founded in the middle of the 13th c. by an English Carmelite friar named Simon Stock, and is said to have originated in a vision, which has been the subject of much controversy, as well with Protestants as among Catholics themselves.

SCARABÆIDÆ, a very numerous tribe of lamellicorn coleopterous insects (see **LAMELICORNES**), of which more than 3,000 species are known, the greater number inhabitants of tropical countries, although species are found in almost all parts of the world. Some of the tropical species are among the largest of beetles; those found in colder regions, as in Britain, are of comparatively small size. The tribe is divided into six sections: *coprophagi* (dung-eaters), *arenicoli* (dwellers in sand), *xylophili* (delighting in wood), *phylophagi* (leaf-eaters), *anthobii* (living on flowers), and *melitophili* (delighting in honey), named according to prevalent and characteristic habits of the species belonging to them, although the names do not accurately denote the habits of all the species of each section. The sections are distinguished by differences in the organs of the mouth and the antennæ. To the section *crotophagi* belong the greater number of the dung beetles (q.v.), or scavenger beetles, so useful in warm countries in removing offensive matter; amongst which is the sacred *scarabæus* of the ancient Egyptians (*scarabæus*, or *ateuchus sacer*). Some of the *xylophili*, as the great Hercules beetle (q.v.), have remarkable projections from the head or the thorax of the males. The cockchafer (q.v.) is an example of the *phylophagi*; the Goliath beetle (q.v.) is one of the *melitophili*, to which section the rose beetle, common in Britain, also belongs. None of the *anthobii* are British.

SCARABÆUS, the name of a beetle held sacred by the Egyptians, commonly known in entomology as the *scarabæus* or *ateuchus sacer*. It was called *heliocantharus* or *cantharus*, by the Greeks, and *scarabæus* by the Latins. Scarabæi were employed for rings, necklaces, and other purposes by the Egyptians, Phenicians, and Etruscans (see **GEMS**). These are principally distinguished by the absence or presence of striated elytra and other marks. Entomologists have recognized four distinct species of the *ateuchus* on the Egyptian monuments, viz., *A. semipunctatus*, *A. laticollis*, *A. morbillosus*, *A. puncticollis*. Several mystical ideas were attributed to the *scarabæus*: the number of its toes, 30, symbolized the days of the month; the time it deposited its ball in which its eggs were deposited, was supposed to refer to the lunar month; the movement of the clay-ball referred to the action of the sun on the earth, and personified that luminary. The *scarabæus* was supposed to be only of the male sex, hence it signified the self-existent, self-begotten generation or metamorphosis, and the male or paternal principle of nature. In this sense it appears on the head of the pygmean deity, Ptah-Socharis Osiris, the demiurgos, and in astronomical scenes and sepulchral formulas. In the hieroglyphs it is used for the syllable *khepru*, and expresses the verb "to be, exist." In connection with Egyptian notions, the Gnostics and some of the fathers called Christ the *scarabæus*. The insect, during its life, was worshiped, and after death, embalmed. —*Horapollo*, i. c. 10; *Ælian*, *De Nat. Anim.* x. 15; Pettigrew, *History of Mummies*, p. 221; Wilkinson, *Man. and Cust.* v. p. 255.

SCARAMOUCH (Ital. *scaramuccia*, skirmish), a character in the old Italian comedy, originally derived from Spain, representing a military poltroon and braggadocio. He was dressed in a sort of Hispano-Neapolitan costume, including a black *toque* and mantle, and a mask open on the forehead, cheeks, and chin, and always received an inglorious drubbing at the hands of harlequin.

SCARBOROUGH (i.e., fortified rock), a seaport and municipal and parliamentary borough in Yorkshire, in the North Riding, 37 m. n.e. of York, and about 20 m. n.w. of Flamborough head. It is built around a charming bay open to the s. and s.w., and protected on the n.e. by a promontory ending in a castle-crowned height, which looks out on the North sea. From the sands the town has gradually climbed the rising ground

behind in successive terraces and crescents. The chief buildings are churches, chapels, and benevolent and other institutions, with which the town is well furnished. A fine cast-iron bridge, 75 ft. high, and stretching over a chasm 400 ft. wide, connects the old and new towns, and leads to the spa, and a bridge was erected in 1865 over a picturesque ravine to connect the western part of the town with its large and fashionable southern suburb. The springs, which are saline and chalybeate, are on the margin of the sea, and are surrounded by walks and ornamental grounds. The harbor, composed of three piers, and furnished with a light-house, is the most important in this part of the e. coast. Every accommodation is offered to visitors for sea-bathing, and Scarborough is reputed the most fashionable watering-place on the n.e. coast. The season lasts from June to the middle of October. In 1895, 113 vessels, of 15,438 tons, entered and cleared the port. Pop. '91, 33,776. The castle was erected about the year 1136. It was held against the barons by Piers Gaveston, who, however, surrendered, and was afterward beheaded. It was twice besieged by the parliamentary forces. At present it serves as a barrack, and is fortified by batteries.

SCARBOROUGH, JOHN, D.D., b. Ireland, 1837; graduated at Trinity college, Hartford, Conn., and at the general theological seminary of the Protestant Episcopal church, New York; was minister at Poughkeepsie, N. Y.; afterward at Trinity church, Pittsburg; elected bishop of the diocese of New Jersey, 1874.

SCARCEMENT, a plain set-off or projection in a wall; foundations have generally one or more scarcements.

SCARE, in heraldry, a small ecclesiastical banner suspended from the top of a crosier.

SCARFING, the junction of two pieces of timber made to overlap, and united so as to appear as one piece.

SCARIDÆ, a family of teleost fishes erected out of the genus *scarus*, belonging to Cuvier's family *labridæ* (q.v.). See also PARROT FISH (*scarus*).

SCARLATINA, or SCARLET FEVER, is one of the group of diseases called exanthemata (q.v.). In addition to the characters common to the group, scarlatina is almost always attended by sore throat, and the rash or eruption, which is of bright scarlet color, commonly appears as early as the second day after the manifestation of the febrile symptoms, and ends in desquamation of the cuticle on the sixth or seventh day. Most writers on medicine make three varieties of this disease—viz., *scarlatina simplex*, in which there are the fever and the rash, but scarcely any throat-affection; *scarlatina anginosa*, in which, in addition to the fever and the rash, the throat-affection is the most prominent symptom; and *scarlatina maligna*, a name which is applied to certain cases of extreme violence, in which the system is at once overwhelmed by the force of the disease, or in which the symptoms evince an extraordinary degree of weakness and want of vital power.

The disease begins with shivering, lassitude, headache, a frequent pulse, a hot dry skin, a flushed face, thirst, loss of appetite, and a furred tongue. Shortly after the appearance of the febrile symptoms, the throat begins to feel irritable, and, on examination, is found to be red, and often more or less swollen. This redness becomes diffused over the interior of the mouth and the tongue. The rash begins in the form of minute red points, which soon become so numerous that the surface appears of an almost uniform red. It first appears on the neck, face, and breast, whence it gradually spreads over the trunk and extremities. The reddened surface is smooth to the touch, and the color temporarily disappears on pressure of the finger. Along with the true rash, minute vesicles, known as *sudamina* (q.v.), sometimes occur. The eruption, in ordinary cases, is persistent for three or four days, after which it gradually disappears, and is usually gone by the end of the seventh day. The cuticle then begins to scale off in small bran-like scurf, or in flakes of various sizes. Specimens of an almost entire epidermic covering of the hand or foot, forming a natural glove or slipper, are of common occurrence in our pathological museums; but it is comparatively seldom that such perfect molting takes place. The desquamative process is usually completed in a fortnight, or rather more, from the commencement of the disease. The fever does not abate on the appearance of the rash, but continues in a more or less decided degree through the progress of the case; it often presents exacerbations toward the evening, and is occasionally attended with delirium, or even with comatose symptoms. If the urine be examined, both chemically and microscopically, a few days after desquamation has set in, it will be found to contain albumen, and to exhibit a large amount of epithelium from the uriniferous ducts of the kidneys (q.v.).

Malignant scarlatina is so terrible a disease that its characteristic symptoms require a brief special notice. The rash comes out late and imperfectly, and sometimes is hardly perceptible; or, having appeared, it may suddenly recede; and sometimes it is intermixed with livid spots. The pulse is feeble, the skin is cold, and there is extreme prostration of strength. In such a case as this, death may occur (apparently from blood-poisoning) in a few hours. Other cases rapidly assume a typhus-like character. "The pulse (says Dr. Watson) becomes frequent and feeble; the tongue dry, brown, and tremulous; the debility extreme; the breath offensive; the throat is livid, swollen, ulcerated,

and gangrenous; and the respiration is impeded by viscid mucus, which collects about the fauces. Over this variety of the disease medicine has comparatively little control."

Even in *scarlatina anginosa* there is very considerable danger. The disease may prove fatal (1) from inflammation or effusion within the head, or (2) from the throat-affection, which too often proceeds to disorganization and sloughing of the adjacent parts. Moreover, in parturient women even the mildest form of the disease is fraught with the greatest peril. Further, when the disease is apparently cured, the patient is exposed to great hazard from its consequences or *sequela*. Children who have suffered a severe attack of scarlet fever are liable (in the words of the eminent physician to whom we have already referred) "to fall into a state of permanent bad health, and to become a prey to some of the many chronic forms of scrofula—boils, strumous ulcers, diseases of the scalp, sores behind the ear, scrofulous swellings of the cervical glands and of the upper lip, chronic inflammation of the eyes and eyelids. The above-named consequences not unfrequently follow small-pox and measles, but, in addition to these, scarlatina is often followed by the form of dropsy known as *anasarca*, or serous infiltration of the subcutaneous cellular tissue, frequently accompanied with dropsy of the larger serous cavities. Strange as it may at first sight appear, this dropsy is much more common after a mild than after a severe form of the disease; but this apparent anomaly is probably due to the fact that less caution is observed in the former than in the latter cases during the dangerous period of desquamation. If the patient (for example) is allowed to go out while new cuticle is still forming, the perspiratory power of the skin is checked by the cold, and the escape of the fever poison through the great cutaneous outlet is thus prevented. An excess of the poison is therefore driven to the kidneys, where it gives rise to the form of renal disease known as "acute desquamative nephritis."

Scarlatina is a disease that—like all the exanthemata—occurs in the epidemic form; and each epidemic presents its peculiar type, the disease being sometimes uniformly mild, and in others almost as uniformly severe. The treatment of this disease varies according to the preponderating symptoms. In *scarlatina simplex* nothing is required except confinement to the house, a non-stimulating diet, and the due regulation of the bowels, which are apt to be constive. In *scarlatina anginosa*, cold or tepid sponging gives much relief if the skin is hot. If there is much fever, and especially if delirium supervene, a few leeches should be applied behind the ears, or if the patient were previously in robust health, blood might be cautiously taken from the arm. If, however, no bad head-symptoms are present, all that is necessary is to prescribe saline draughts, of which citrate of ammonia, with a slight excess of carbonate of ammonia, forms the best ingredient, and to keep the bowels open once or twice a day by gentle laxatives. In *scarlatina maligna* there are two main sources of danger, which were first recognized as distinct by Dr. Watson, who describes them as follows: "The one arises from the primary impression of the contagious poison upon the body, and particularly upon the nervous system, which is overwhelmed by its influence. The patients sink often at a very early period, with but little affection either of the throat or skin. If we can save such patients at all, it must be by the liberal administration of wine and bark, to sustain the flagging powers until the deadly agency of the poison has in some measure passed away. But another source of danger arises from the gangrenous ulceration which is apt to ensue in the fauces, when the patient is not killed by the first violence of the contagion. The system is *re-inoculated*, I believe, with the poisonous matter from the throat. Now, under these circumstances also, quinia, or wine, and upon the whole, I should give the preference to wine, is to be diligently though watchfully given." In addition to these remedies, a weak solution of chloride of soda, or nitrate of silver, or of Condy's disinfectant fluid, should be used as a gargle; or if, as is too often the case, the patient is incapable of gargling, the solution may be injected into the nostrils and against the fauces by means of a syringe or elastic bottle.

Three medicines have been so highly commended in scarlet fever generally, by trustworthy observers, that it is expedient to notice them. The first is chlorate of potash, KClO_3 , dissolved in water in the proportion of a dram to a pint. A pint, or a pint and a half, may be taken daily. It was originally prescribed under the idea that it gave off its oxygen to the blood, and was eliminated from the system as chloride of potassium, KCl . Although this view is now known to be incorrect, there is no doubt that the salt is often prescribed with great benefit in this and some other diseases, as for example, diphtheria and typhus fever. The second medicine is a very weak, watery solution of chlorine, of which a pint may be taken in the day; and the third is carbonate of ammonia in five-grain doses three times a day, given in beef-tea, wine, etc.

In the early stage, before the appearance of the rash, scarlatina may be readily mistaken for several other febrile diseases; after the appearance of the rash, the only disease for which it can be mistaken is measles, and we must refer to the article on that disease for a notice of the distinctive characters of the two affections.

There is no complaint in which the final result is more uncertain than this, and the physician should give a very guarded opinion as to how any special case may terminate.

Whether the disease is contagious throughout its course, or only at one particular period, is unknown; and if the physician is asked at what period the danger of imparting the disease on the one hand, or catching it on the other, is over, he should candidly

declare that he does not know. That the contagion remains attached to furniture, clothing, etc., for a long period is undoubted. Dr. Watson gives a remarkable instance of a small piece of infected flannel communicating the disease after the interval of a year.

The popular delusion that *scarlatina* is a mild and diminutive form of *scarlet fever* should always be corrected, as the error, if uncorrected, may do much harm by leading to a disregard of those precautions which are always necessary in this disease.

SCARLATTI, ALESSANDRO, a musician of great eminence, b. at Trapani in Sicily in 1659. He is said to have studied under Carissimi; if so, it must have been when very young. In 1680 Scarlatti visited Rome, and composed his first opera, *L'onesta nell'amore*, first performed at the court of queen Christina of Sweden. His opera *Pompeo* was performed at Naples in 1684. In 1693 he composed the oratorio, *I Dolori di Maria sempre Vergine*, and the opera *Teodora*, in which orchestral accompaniments were first introduced to the recitatives, and a separate design given to the accompaniments to the airs. In the following eight years, during part of which time he held the office of *maestro di capella* at Naples, he produced various operas, the most remarkable being *Laodicea e Berenice*, composed in 1701. Between 1703-9 he held the situation of *maestro di capella* at St. Maria Maggiore at Rome; he then returned to Naples; and in 1715 produced *Il Tigrane*. Alessandro Scarlatti died in 1725. His musical works comprise 117 operas, several oratorios, and a great deal of church music, besides various madrigals and other chamber music. He was the founder of the Neapolitan school, in which were trained most of the great musicians of the last century, and whose influence can be traced in the works of almost every composer who has flourished since. His invention was rich and bold, his learning great, and his style pure. His modulations, often unexpected, are never harsh, and never difficult for the voice. His son, DOMENICO (born 1683, died 1757), was the first harpsichord player of his day. Among his compositions are a number of sonatas, remarkable for invention, graceful melody, and skillful construction. Domenico Scarlatti had a son, GIUSEPPE (born 1718, died 1796), who was also known as an eminent musician.

SCARLET COLORS. Cochineal furnishes the only scarlet color generally employed in dyeing, and for this purpose it is very extensively used; a solution of tin and cream of tartar is employed as the mordant to fix it. Scheffer, who produced the best formula for dyeing this color, also added starch, the proportions being as follow: Starch, 9 lbs.; cream of tartar, 9 lbs. 6 oz.; solution of tin, 9 lbs. 6 oz.; and cochineal, 12 lbs. 4 oz. These are the quantities required for 190 lbs. of wool or cloth.

SCARLET RUNNER. See KIDNEY BEAN.

SCARP. See ESCARP.

SCARPA, ANTONIO, a celebrated anatomist, was born on June 13, 1747, at Castello-Motta, a village in the Friuli. He was educated at Padua, where his ardor attracted the attention of the octogenarian Morgagni, who, having lost his sight shortly after the arrival of Scarpa at the university, engaged the young enthusiast as his secretary, and dictated to him in Latin the answers which he made to letters soliciting his advice. The intervals between their medical studies were employed by Morgagni and Scarpa in the perusal of the Latin authors, and it is to this practice that we must ascribe the elegance that distinguished the scientific style of Scarpa in his subsequent publications. In 1772 he was appointed professor of anatomy in Modena. He afterward visited France, Holland, and England; and while in London, was so enamored of John Hunter's museum, that he did not rest until he had constructed a similar one at home. In 1784 he filled the anatomical chair at Pavia. He made, in the following year, a journey throughout the greater part of Germany, and in the course of it acquired the experience that made him one of the greatest clinical surgeons in Europe. On his return to Pavia, he published in rapid succession treatises on the anatomy of the organs of smell and hearing; on the nerves of the heart, and on the minute anatomy of bone. These, especially that on the innervation of the heart, which settled the question whether that viscus was supplied with nerves, gave Scarpa a European reputation. His work on the diseases of the eye, published in 1801, was followed in 1804 by his observations on the cure of aneurism. But his greatest achievement was his work on hernia, published in 1809. His reputation was now at its highest, but three years afterward, he had to give up the work of public teaching, and entered, in 1814, on the office of director of the medical faculty of Pavia. His next publication was some valuable observations on the operation for stone. For the last years of his life he suffered from almost total blindness, until, on Oct. 31, 1832, he died at Pavia, of inflammation of the bladder. Scarpa's merits as an observer, a teacher, and a writer were very great. Industrious, scholarly, artistic, he appeared to great advantage in nearly every subject he undertook.

SCARPANTO (anc. *Carpantos*), an island of the Ægean Sea belonging to Turkey, midway between the islands of Rhodes and Crete. It is 32 m. long, and about 8 m. in extreme breadth, and its surface is covered with bare mountains, which reach the height of 4000 feet. The ruins of towns, which are found in several places, seem to indicate that formerly the island was well peopled. At present the inhabitants are only about

5,000 in number, and are mostly employed as carpenters and workers in wood, a trade of which they seem peculiarly fond, and in commerce.

SCARPE, in heraldry, a diminutive of the bend sinister, being half the breadth of that ordinary.

SCARRON, PAUL, the creator of French burlesque, was b. at Paris in 1610. His father, a counselor of parliament, was a man of fortune and good family; but he having married again after the death of Paul's mother, discord broke out between the second wife and her step-children, the result of which was that Paul had to leave the house. About 1634; he visited Italy, where he made the acquaintance of Poussin the painter. On his return to Paris, he delivered himself over to a life of very gross pleasure, the consequence of which was that, in less than four years, he was seized with permanent paralysis of the limbs. What makes this incident in his career still interesting is the fact, that it undoubtedly exercised no inconsiderable influence on the development of his peculiar genius, which, as a French critic justly says, was "the image of his body." His love of burlesque, of malicious buffoonery, of profane gaiety, was simply a way of escape through the gates of mockery from the *tourmens vehemens* of his incurable ailment. His scramble for the means of living is excusable when we consider his hapless infirmity. He wrote verses, flattering dedications, begging-letters for pensions, etc.; and in 1643 he even managed to get a benefice at Mans, which he held for three years, when he returned to Paris, and lived in a sort of elegant Bohemian style. He had a pension from Mazarin of 500 crowns; but when the cardinal declined (probably from avarice) to allow the *Typhon* to be dedicated to him, Scarron got absurdly indignant, and joining the Frondeurs, lampooned Mazarin with spleenful virulence. However, when the war of the Fronde was at an end, and Mazarin had triumphed, Scarron was ready with an ode to

Jule, autrefois l'objet de l'injuste satire.

This baseness, however, did not win him back his pension, which the "object of his unjust satire" had withdrawn; and it might have fared hard with the poet had other friends not started up—for example, Fouquet, who granted him a pension of 1600 crowns—and had he himself not been the most consummate beggar that ever lived. If he could not get a benefice or a purse of gold, or a lodge at court, he would take a load of firewood, or a carriage, pasties, capon, cheese, poodles, etc.—nothing came amiss; and his ample acknowledgements showed how thoroughly he had mastered the art of expressing gratitude. Doubtless his physical helplessness induced this bad habit, but his importunities were so pleasantly worded that they never estranged the friends on whom he fastened. In 1652, Scarron married Françoise d'Aubigné—a girl of 17, who subsequently became the mistress of Louis XIV., and is known as Madame Maintenon (q.v.). He died early in October 1660—the exact date is not known, but he was buried on the 7th. It is a proof of the charm of his company that his rooms were frequented by most of the men and women of his day who were distinguished either in literature or society. Among his works may be mentioned *Le Typhon*, *Virgile Travesti* (Par. 1648-52), *La Mazarinade* (1649), *La Baronade*, *Léandre et Héro*, *Ode Burlesque*, *La Relation du Combat des Purques et des Poëtes sur la Mort de Voiture*, *Poésies Diverses* (Par. 1643-51), comprising sonnets, madrigals, epistles, satires, songs, etc.; *Le Roman Comique* (Par. 1651), a most amusing account of the life led by a company of strolling players—it is the best known, and perhaps the best of all Scarron's productions; *Nouvelles Tragicomiques*, from one of which (*Les Hypocrites*) Molière has taken the idea of Tartufe; besides a number of clever but coarse comedies. The editions of his works are very numerous, but the best is that of Bruzen de la Martinière (Amster., 10 vols., 1737; Par., 7 vols., 1786). Victor Fournel, to whom we are indebted for most of the information in this article, republished *Le Roman Comique*, in 1857, and *Le Virgile Travesti* in 1858.

SCATTERY ISLAND, a small islet in the estuary of the Shannon, 3 m. s.w. of the town of Kilrush. Besides a fort, the islet contains fragments of several small churches, and an ancient round tower.

SCAUP DUCK, *Fuligula*, or *Nyroca*, *marila*, an oceanic species of duck, of the same genus with the pochard (q.v.) an inhabitant of the northern parts of the world, spending the summer in arctic or subarctic regions, and visiting the coasts of Britain and of continental Europe as far s. as the Mediterranean in winter, when it is also to be seen in great flocks in the United States, not only on the sea-coast, but on the Ohio, Mississippi, and other rivers. It breeds in fresh-water swamps. It is nearly equal in size to the pochard. The male has the head, neck, and upper part of the breast and back black, the cheeks and sides of the neck glossed with rich green; the back white, spotted and striped with black lines; the wing-coverts darker than the back, the speculum white; the rump and tail-coverts black. The female has brown instead of black, and old females have a broad white band around the base of the bill. The flesh of the scaup duck is tough, and has a strong fishy flavor.

SCAURUS, MARCUS ÆMILIUS, B.C. 163-89; b. Rome; served with distinction in the army, and became curule ædile in 123. He was elected *prætor urbanus* in 120, and consul in 115. During his term in the latter office, he was made *princeps senatus*, and

awarded a triumph for his defeat of the Ligurians. In 112 he headed a legation to Jugurtha in Africa for the purpose of persuading the latter to redress the injuries which he had done to Adherbal. The mission failed, and in the subsequent war Scaurus was legate of the consul Bestia. Scaurus, with others, was bribed by Jugurtha to negotiate peace, but escaped punishment. He was again consul in 107. His son, MARCUS ÆMILIUS, was Sulla's stepson, and acquired an immense estate by his stepfather's proscription, and by receiving bribes in Asia, when he was *quaestor* to Pompey. He spent his riches in celebrating the games while curule ædile, was praetor in 56, and gained another fortune by his extortions in Sardinia, which he governed in 55. He was tried, defended by Cicero and Hortensius, and acquitted.

SCENA. See THEATER.

SCEPTER (Gr. *skēptron*, staff; from *skēpto*, to send or thrust) originally a staff or walking-stick, hence in course of time, also a weapon of assault and of defense. At a very early period the privilege of carrying it came to be connected with the idea of authority and station. Both in the Old Testament and in Homer, the most solemn oaths are sworn by the scepter, and Homer speaks of the scepter as an attribute of kings, princes, and leaders of tribes. According to Homer, the scepter descended from father to son, and might be committed to any one to denote the transfer of authority. Among the Persians, whole classes of persons vested with authority, including eunuchs, were distinguished as the "scepter-bearing classes." The scepter was in very early times a truncheon pierced with gold or silver studs. Ovid speaks of it as enriched with gems, and made of precious metals or ivory. The scepter of the kings of Rome, which was afterward borne by the consuls, was of ivory and surmounted by an eagle. While no other ensign of sovereignty is of the same antiquity as the scepter, it has kept its place as a symbol of royal authority through the middle ages and down to the present time. There has been considerable variety in its form; the scepter of the kings of France of the first race was a gold rod as tall as the king himself.

SCEPTICISM. See SKEPTICISM.

SCHADOW, FRIEDRICH WILHELM VON, a distinguished German painter, of the Düsseldorf school, was b. at Berlin, Sept. 6, 1789. His father, Joh. Gottf. Schadow, an eminent sculptor, died director of the Berlin academy of arts, in 1850. At first young Schadow did not give much promise of excellence, but during his first visit to Rome, the influence of Overbeck, Cornelius, Führich, Veit, etc., awoke his dormant genius, and both singly and in company with some of these artists, he executed several pictures remarkable for their depth of religious sentiment; as "An Explanation of the Dream of Joseph," and "The Grief of Jacob when told of the Death of his Son." While residing in the city of the pope, he passed over to Roman Catholicism. Scarcely had Schadow returned to Berlin when he was appointed professor of the academy, and soon gathered round him a host of brilliant pupils; but in 1826 he went to Düsseldorf as successor of Cornelius, in the direction of the notable academy there. His pupils followed him, and ever since the "Düsseldorf school" has been associated specially with their names. Schadow's principal works are "Mignon" (1828); "The Four Evangelists," "The Wise and Foolish Virgins," "The Source of Life," "The Assumption," and "Heaven," "Purgatory," and "Hell." Schadow was ennobled in 1843. *Der Moderne Vasari* (1854) is a book from his hand. He died Mar. 19, 1862.

SCHAEFF, PHILIP, S.T.D., LL.D.; b. Coire, Switzerland, 1819; studied at Stuttgart, Tübingen, Halle, and Berlin; traveled in 1841 as private tutor in France, Switzerland, and Italy; returned to Berlin and lectured on theology 1842-44; emigrated to America in 1844; professor of theology in the German Reformed theological seminary at Mercersburg, Penn., 1844-62; lectured at Andover on church history, 1862-67; secretary of the New York Sabbath committee, 1864-69; elected professor of church history in Hartford theological seminary in 1868; became professor of church history in the Union theological seminary, New York, in 1870, which position he long held. Of his numerous works the following are the most important: *The Sin against the Holy Ghost*; *James the Brother of the Lord*; *The Principle of Protestantism as related to Romanism and the Present State of the Church*; *History of the Apostolic Church, with a General Introduction to Church History*; *The Life and Labors of St. Augustine*; *America: A Sketch of the Political, Social, and Religious Character of the United States of America*; *Germany, its Universities, Theology, and Religion*; *History of the Christian Church from the Birth of Christ to the Reign of Constantine*; *German Hymn-Book*; *Essay on the Moral Character of Christ*; *The Christ of the Gospels*; *Essay on Slavery and the Bible*; *The Civil War in America*; *The Creeds of Christendom*; *Harmony of the Reformed Confessions*; *Through Bible Lands*; *Dictionary of the Bible*; *Library of Religious Poetry* (with Arthur Gilman); *Popular Commentary on the New Testament*; *Companion to Greek Testament and English Version*; a revised and completed edition of the *History of the Christian Church*, etc. He also edited Lange's *Commentary on the Holy Scriptures*, and the *Encyclopædia of Religious Knowledge*, an exceedingly valuable work based on Herzog's *Real-Encyclopædie*, and the *International Revision Commentary on the New Testament*; besides taking a prominent part in the revision of the Bible. Died 1893.

SCHAFFHAUSEN, the most northern canton of Switzerland, is bounded on all sides but the s. by the duchy of Baden. Area, 114 sq. m.; pop. '94, 37,465, of whom about 4761 were Catholics. The chief river is the Rhine, which forms part of the southern boundary, and within the basin of which the canton is wholly included. The surface is hilly, especially in the n. and e., and of the many rich valleys that slope southward to the Rhine, that of the Klettgau is famous for its unusual fertility, and for its wines, the bouquet of which is peculiarly fine. The climate is mild; the soil, which is mostly calcareous, is generally fruitful, and agriculture is the principal branch of industry. There are also many manufactures.

SCHAFFHAUSEN, a t. of Switzerland, capital of the canton of the same name, beautifully situated on the right bank of the Rhine, immediately above the celebrated falls of that river. Higher up the slope on which the town stands is the curious castle of Munoth, and this edifice and the minster, founded in 1052, are the chief buildings. The town is remarkable for the antique architecture of its houses. The old wall and gateways of Schaffhausen are also very picturesque. Pop. '88, 12,360, partly engaged in the manufacture of iron, cotton, and silk goods. The falls of Schaffhausen, about 3 m. below the town, form perhaps the most imposing spectacle of the kind in Europe. The river is here 300 ft. broad, and the entire descent is about 100 feet. There is a large variety of manufactures.

SCHALL, JOHANN ADAM VON, a celebrated Jesuit missionary to China, was b. of noble family at Cologne in 1591; was sent as a missionary to China in 1620. Having turned to good account among the Chinese his scientific knowledge, he not only succeeded in forming a flourishing mission, but was ultimately invited to the imperial court at Pekin, where he was entrusted with the compilation of the calendar and the direction of the public mathematical school, being himself created a mandarin. Such was his favor with the emperor, that, contrary to all the received etiquette, he had the privilege of free access to the presence of the emperor Chun-Tche, the founder of the Tartar dynasty (1645), and was honored by visits from the emperor at four stated times in each year. Through this favor with the emperor, Schall obtained an edict which authorized the building of Catholic churches, and the liberty of preaching throughout the empire; and in the space of 14 years the Jesuit missionaries in the several provinces are said to have received into the church 100,000 proselytes. On the death of this emperor, however, a change of policy fatal to the prospects of Christianity took place. The favorable edict above referred to was revoked; Schall was thrown into prison and sentenced to death. He was afterward liberated; but he was again imprisoned, and, at the end of a long incarceration, died Aug. 15, 1669.

SCHARNHORST, GERHARD JOHANN DAVID VON, a Prussian general, born Nov. 12, 1755, in Hanover. He entered the Hanover military service in 1778 and the Prussian in 1801, when he became director of the Prussian military school. In 1806-7 he took the field against the French, and for three years after that he was president of the commission that reorganized the Prussian army, and director of the war department. In 1813 he was severely wounded at the battle of Grossgörschen and died six weeks after. He wrote *Handbuch für Offiziere* (1787); *Militärische Denkwürdigkeiten* (1797).

SCHARWENKA, PHILIPP, a German composer, born at Samter, in east Prussia, Feb. 16, 1847, and was a pupil of Kullak, in whose conservatory at Berlin he taught, 1870-81. He has written symphonies, overtures, and works for the piano, violin, violoncello, etc.

SCHARWENKA, XAVER, pianist and composer, brother of the preceding, born at Samter in 1850; was both pupil and teacher at Kullak's conservatory, and has played in public in Germany, England, and in the U. S. In 1891 he became director of a school of music in New York. He has written a piano concerto, string trios and quartets, and a violin and a violoncello sonate.

SCHÄSBURG, or SCHASSBURG (Magyar, *Segesvá*), a t. of Austria, in Transylvania, on the great Kokel. It contains a college, a museum, and some manufactures. Pop. '90, 9618.

SCHAUFFLER, WILLIAM GOTTLIEB, D.D., PH.D., LL.D.; b. Stuttgart, Germany, in 1798; went with his parents at the age of six to Odessa, Russia; at the age of 22 became religiously impressed, and desired to be a missionary; began to study English with a young English merchant in 1825; met at Odessa the eccentric Joseph Wolf, and accompanied him to Turkey for mission work, but, convinced that he needed more study, resorted to America by advice of the Rev. Jonas King, whom he met at Smyrna; went to Andover; worked part of the time at his trade as a turner. After a three years' course in the theological seminary, he remained another year studying Chaldee, Syriac, Arabic, Persian, Turkish, and Spanish; was ordained in 1831 and sent by the American board to Paris to study Arabic and Persian with De Sacy, and Turkish with Prof. Kieffer; went to Constantinople; preached in German, French, Spanish, Turkish, and English. By appointment of the British and foreign and American Bible societies, he devoted himself to the translation of the Bible into the Osmanlee, or the higher and purer Turkish language. In 1867 he received the degree of D.D. and PH.D. from the universities of Halle and Wittenberg. He published, twice, an ancient Spanish version of the Old Testament, revised by himself, with the Hebrew original, in parallel columns, a grammar of the Hebrew language in Spanish, and a Hebrew and Chaldee lexicon of the Old Testament in the same language; *Meditations on the Last Days of Christ*, discourses delivered in Constantinople, first printed in Boston in 1837, and recently issued

by the American tract society. He contributed articles in Spanish to a missionary periodical in Salonica. His life, filled with useful labor, ended 1883.

SCHAUMBURG-LIPPE, a sovereign German principality, includes the western part of the former county of Schaumburg, and is bounded on the w. by Westphalia and the n. by Hanover. Area, 174 sq. m.; pop. '95, 41,224. Till 1866 the constitution was on the ancient patriarchal basis; but since, the Schaumburg-Lippe has a representative diet of 15 members, 10 of whom are elected by the towns and the country districts, the rest by the prince, the nobility, and the clergy and educated classes. It has one vote in the federal council of the German empire, and sends one deputy to the Reichstag. The budget for 1896-97 places the revenue and expenditure at 931,281 marks. The public debt was 360,000 marks.

SCHEELE, KARL WILHELM, an eminent Swedish chemist, was b. at Stralsund, 1742, and after receiving a brief and incomplete education was apprenticed to an apothecary at Gothenburg, where he laid the foundation of his knowledge of chemistry. In 1767 he settled at Stockholm as an apothecary; and in 1770 removed to Upsala, where at that time the celebrated Bergmann was professor of chemistry. It was during his residence at Upsala that he carried on those investigations in chemical analysis which proved so fruitful in important and brilliant discoveries, and placed their author by the side of Linnæus and Berzelius, his countrymen—in the front rank of science. In 1777 he removed to Köping to take possession of a vacant apothecary business, but died of ague-fever, May 24, 1786, at a time when he was receiving the most tempting offers from England to persuade him to settle in that country. The chief of his discoveries were tartaric acid (1770), chlorine (1774), baryta (1774), oxygen (1777), and glycerine (1784), the second last of which had been previously made known through the labors of Priestley, though Scheene was not aware of this till after his own discovery of it in 1777. In experimenting on arsenic and its acid, he discovered the arsenite of copper, which is known as a pigment under the name of *Scheele's green* or *mineral green*. In 1782, during an eminently delicate and subtle investigation to determine the nature of the coloring matter in Prussian blue, he succeeded in obtaining, for the first time, prussic acid in a separate form. The mode and results of his various investigations were communicated from time to time, in the form of memoirs, to the academy of Stockholm, of which he was an associate, and also in his chief work, the *Chemical Treatise on Air and Fire* (1777), and in an *Essay on the Coloring Matter in Prussian Blue* (1782).

SCHEELE'S GREEN. See ARSENIOUS ACID.

SCHAEFFER, ARY, a French painter, b. at Dort, in Holland, Feb. 10, 1795; studied under Guerin of Paris, and made his début as an artist in 1812. Some years later appeared his "Mort de Saint-Louis," "Le Dévouement des Bourgeois de Calais," and several *genre* pieces, such as "La Veuve du Soldat," "Le Retour du Conscrit," "La Sœur de Charité," "La Scène d'Invasion," etc., which have been popularized in France by engravings; but compared with his later performances these early pictures have little merit. It was not till the "Romantic" movement reached art that Schaeffer began to feel conscious of his peculiar power. The influence of Goethe and Byron became conspicuous in his choice of subjects, and to the remarkable facility of execution that had always marked him, he now added a subtlety and grace of imagination that give an inexpressible charm to his works. The public admired his new style greatly, and lavished eulogy with liberal hand on his "Marguerite à son Rouet," "Faust Tourmenté par le Doute," "Marguerite à l'Eglise," "Marguerite au Sabbat," "Marguerite sortant de l'Eglise," "Marguerite au Jardin," "Marguerite à la Fontaine," "Les Mignons," "Le Larmoyeur," "Francesca de Rimini," etc. Toward the year 1836 his art underwent its third and final phase—the religious. To this class belong his "Le Christ Consolateur," "Le Christ Rémunérateur," "Les Bergers conduits par l'Ange," "Les Rois Mages déposant leurs Trésors," "Le Christ au Jardin des Oliviers," "Le Christ portant sa Croix," "Le Christ enseveli," and "Saint Augustin et sa Mère Sainte Monique," some of which are well known in England by engravings. Schaeffer also executed some remarkable portraits; among others, those of LaFayette, Béranger, Lamartine. He died at Argenteuil, near Paris, June 15, 1858.

SCHELDT, THE (pron. *Skelt*; Lat. *Scaldis*, Fr. *l'Escaut*) rises in the French dep. of Aisne, flows northerly to Cambrai, Valenciennes, Bouchain, and Condé, when, entering Belgium, it passes Doornik, Oudenarde, Ghent, Dendermonde, Rupelmonde, and Antwerp, having received, among other tributaries, the Lys, Dender, and Rupel. Navigable from its entrance into Belgium, the Scheldt at Antwerp becomes a noble river, of sufficient depth for large ships. From Antwerp the course is n.w., to fort Bath, in the Netherlands, where, coming in contact with the island of South Beveland, it divides into two arms. The left or southern, called the Honte or Western Scheldt, takes a westerly direction, s. of the islands of Zeeland, and meets the North sea at Flushing; the northern or right arm, called the Kreekerak, flows between Zeeland and North Brabant, near Bergen-op-zoom, dividing again into two branches, the left, called the Easter Scheldt, passing between the islands of Tholen and Schouwen on the right, and the Bevelands on the left, reaches the sea through the Roompot (*Romanorum portus*); the other branch, flowing between North Brabant and Zeeland, discharges itself by several passages. These several mouths of the Scheldt, forming various islands, are called the Zeeland streams. Total length of course, 270 m.

The Dutch had long monopolized the navigation of the lower Scheldt; and by the treaty signed in London (April 19, 1839), the Netherlands secured the right of levying 2s. 6d. per ton on all vessels. By a treaty signed at Brussels, July 16, 1863, this toll has been bought up, nominally by Belgium, but in reality from a sum of \$3,750,000 paid to that country by the powers whose ships navigate the Scheldt.

SCHELL, AUGUSTUS, 1812-84; b. Rhinebeck, N. Y.; graduated at Union College; became a lawyer, and entering actively into politics, was in 1852 the Tammany nominee for governor. He was collector of the port of New York under Buchanan; was associated in the directory of the Vanderbilt railroad combination; offered bail for the release of Jefferson Davis, 1867; member of committee to revise constitution of New York; unsuccessful Tammany candidate for state senator, 1877 and for mayor, 1878.

SCHLEIBENBERG, a village in the kingdom of Saxony, 8 m. e. of Chemnitz. Pop. '90, 2242.

SCHELLING, FRIEDR. WILH. JOS. VON, an illustrious German philosopher, was b. at Leonberg, in Württemberg, Jan. 27, 1775, studied at Tübingen and Leipzig, and in 1798 proceeded to Jena, then the headquarters of speculative activity in Germany, through the influence of Reinhold and Fichte. Schelling's philosophical tendencies were originally determined by Fichte; in fact, he was at first only an expounder, though an eloquent and independent one, of the Fichtian idealism, as one may see from his earliest speculative writings, *Ueber die Möglichkeit einer Form der Philosophie* (On the Possibility of a Form of Philosophy, Tüb. 1795), *Vom Ich als Princip der Philosophie* (Of the Ego as the Principle of Philosophy, Tüb. 1795), and others. Gradually, however, Schelling diverged from his teacher, and commenced what is regarded as the second phase of his philosophy. Fichte's idealism now seemed to him one-sided and imperfect through its rigorous and exclusive subjectivity, and he sought to harmonize and complete it. The result of his speculations, in this direction, was the once famous *Identitätsphilosophie* (Philosophy of Identity), which claimed to show that the only true knowledge, and, therefore, the only philosophy, was that of the infinite-absolute, in which the "real" and ideal, "nature" and "spirit," "subject" and "object," are recognized as absolutely the same; and which affirmed the possibility of our attaining to such knowledge by a mysterious process, known as "intellectual intuition." The "Philosophy of Identity," though only the second stage in Schelling's speculative career, is the most important, and is the one by which he is best known in England—sir William Hamilton having elaborately discussed it, and endeavored to demonstrate its untenableness in his essay on the "philosophy of the conditioned" (see *Discussions in Philosophy and Literature, Education and University Reform*, 1852). The principal works in which it is more or less completely developed, are *Ideen zu einer Philosophie der Natur* (Ideas toward a Philosophy of Nature, Leips. 1797, 2d ed. 1803); *Von der Weltseele eine Hypothese der Höhern Physik zur Erläuterung des Allgemeinen Organismus* (Of the World-soul, an Hypothesis of the higher Physics in elucidation of the Universal Organism, Hamb. 1798, 3d ed. 1809); *Erste Entwurf eines Systems der Naturphilosophie* (First Attempt at a Systematic Philosophy of Nature, Jena, 1799); and *System des Transcendentalen Idealismus* (System of Transcendental Idealism, Tüb. 1800). In 1803, after the departure of Fichte from Jena, Schelling was appointed to succeed him, but in the following year went to Würzburg, whence, in 1808, he was called to Munich as secretary to the academy of arts, and was ennobled by king Maximilian-Joseph. Here he lived for 33 years, during the last 14 of which he occupied the chair of philosophy in the newly-established university of Munich, but in 1841 he followed a call from Friedrich-Wilhelm IV. to Berlin, where he mainly resided for the rest of his life. He died at the baths of Ragaz, in Switzerland, Aug. 20, 1854. We now revert to Schelling's philosophical career. What may be regarded as its third period, if not its third phase, is chiefly marked by incessant controversy. With the exception of *Bruno, oder über das Göttliche und Naturliche Princip der Dinge* (Bruno, a Dialogue concerning the Divine and Natural Principle of Things, Berl. 1802), and the *Vorlesungen über die Methode des Akademischen Studiums* (Lectures on the Method of Academical Study, Stuttg. and Tüb. 1803), most of Schelling's writings are polemical—often hotly so. The most notable are, his *Philosophie und Religion* (Tüb. 1804), in reply to Eschenmayer; *Denkmal der Schrift von den Göttlichen Dingen* (Tüb. 1812), in reply to Jacobi; and *Darlegung des Wahren Verhältnisses der Naturphilosophie zur verbesserten Fichte'schen Lehre* (Statement of the true relation of the Nature-philosophy to the improved Fichtian Doctrine, Tüb. 1806). Meanwhile, a most formidable adversary had risen up in his old college friend Hegel (q. v.), who was at first an ardent disciple of Schelling's, just as Schelling had been of Fichte, but who had, in a similar manner, broken away, and was now pursuing an independent, and professedly antagonistic, course of speculation. During the reign of Hegelianism, Schelling preserved an almost unbroken silence. For more than 20 years he published almost nothing, but we know that he was far from being idle. He was observing narrowly the practical as well as the speculative results of the rival system, and maturing his own philosophy for the final phase which it assumed, and which he called variously, the "positive," the "historical," and the "system of freedom"—the design of which was to interpret, at once philosophically and reverentially, the history, and, especially, the religious history of mankind. Schelling admitted that his earlier speculations, though sound in themselves, attained only to "negative" truth, and to show that the most transcendental metaphysician need not be a Pantheist, but

might be a believer in a personal God, or even in a Trinity, with a whole Augsburg Confession to boot, he began to apply or develop in a practical way what he conceived to be the principles of his system. It cannot be said that the result has proved satisfactory, though many of his contemporaries thought it would—Neander, for example, dedicating to him, in the most eulogistic terms, the first volume of his *Kirchengeschichte*, on the ground that it was in harmony with Schelling's new philosophy. The writings that contain the fruits of Schelling's latest thinking were for the most part posthumously published, although a general idea of them had become known to the public through such lectures as those on the *Philosophy of Mythology*, and the *Philosophy of Revelation*. Schelling's *Sämmtliche Werke* (14 vols. Stuttg. 1856-61) were edited by his sons, Karl Friedr. Aug., and Hermann Schelling. His correspondence was published at Munich in 1863. Various French writers, such as MM. Matter, Remusat, Cousin, Michelet, have tried (with indifferent success) to explain the great mystic to their countrymen; and English philosophical literature is dubiously associated with his name, through what may be called the somnambular plagiarisms of a kindred genius, Samuel Taylor Coleridge. These were first pointed out by Prof. Ferrier in *Backwood's Magazine*, Mar. 1840.

SCHEM, ALEXANDER JACOB, b. Westphalia, 1826; d. U. S., 1881; studied at Bonn, and Tübingen; co-editor, 1849-51, of *Westphalisches Kirchenblatt*, and editor of *Volksblatt für Stadt und Land*; editorially connected with the *Methodist Quarterly Review* and *The Methodist*; has contributed to the *Independent*, *Christian Advocate*, *The World*, and *Appleton's* and *McClintock and Strong's Cyclopædia*. He published, with Rev. George R. Crooks, a *Latin-English School Lexicon*, and was one of the editors of Steiger's *Cyclopædia of Education*.

SCHEMNITZ, a large and famous mining city of Hungary, stands in a narrow mountain gorge, at the height of 1054 ft., on a river of the same name, 66 m. n. of Pesth. Besides the town proper there are six suburbs, some of which, however, are at a distance of several miles; the town proper had (1890) 15,280 inhabitants. The academy for mining and woodcraft, embracing collections of minerals and a chemical laboratory, is the principal building, and forms the chief architectural feature of the town. The town was in existence in the 8th century, and in the 13th century the mints were spoken of, and not as though they were at all new. A highly-esteemed kind of tobacco-pipe heads is manufactured here. The mines, which extend under the town, have been worked for centuries, though recently they yielded but an inconsiderable profit. They produce gold and silver, as well as copper, iron, and sulphur.

SCHENCK, KARL EMANUEL, b. 1823; Swiss statesman; was elected pres. of the republic, for the sixth time, 1893. He was in politics a progressive radical. He was head of the department of the interior at the time of his death, which occurred in 1895.

SCHENCK, NOAH HUNT, D.D., b. New Jersey, 1825; graduated at Princeton college in 1844, and at Gambier theological seminary in 1853; ordained a minister of the Protestant Episcopal church, rector, for several years, of Emmanuel church, Baltimore; became pastor of St. Ann's church, Brooklyn, N. Y., in 1869. He established and edited, 1858-60, the *Western Churchman*, Chicago; was co-editor of the *Protestant Churchman* in 1867; contributed to the *Western Episcopalian*, and published numerous sermons, essays, treatises, and orations. He d. 1885.

SCHENCK, ROBERT CUMMING, 1809-90; b. Ohio; graduated at Miami university, 1827; taught there; admitted to the bar; served in the state legislature; in 1843 elected to congress, where he served four terms; minister to Brazil 1851-53. When the war broke out he was made brig.gen. of volunteers, and served at Bull Run, in West Virginia, and in the Shenandoah valley. In the second battle of Bull Run he commanded a division under Sigel, and had his arm shattered by a ball. He continued in the army, but in 1863 was again elected to congress, where he remained until 1871, when he was appointed minister to England by President Grant, which position he held until the spring of 1876.

SCHENECTADY, a co. in e. New York, intersected in the e. by the Erie canal, the New York Central and Hudson River, several branches of the Delaware and Hudson, the Schenectady and Boston, and the West Shore railroads; 200 sq. m.; pop. '90, 29,797, chiefly of American birth, with colored. It is drained by Norman's Kill, the Mohawk, and Schoharie rivers. Co. seat, Schenectady.

SCHENECTADY, city and co. seat of Schenectady co., N. Y.; on the Mohawk river, the Erie canal, and the Delaware and Hudson and the New York Central and Hudson River railroads; 17 miles w. of Albany. It is one of the oldest places in the state, having been settled by Arent Van Corlear in 1661. In 1690, Feb. 9, the inhabitants were massacred by the French and Indians, and in 1748, a second massacre occurred here. It was incorporated as a city in 1798. Schenectady is the seat of Union college (founded in 1795) with a preparatory school; and has the Ellis hospital, free public library, opera-house, city hall, a state armory, court-house, and county buildings, children's home, home for the friendless, electric lights, electric street railroads, water-works supplied from wells in immense gravel beds, national, state, and savings banks, about 25 churches, and daily, weekly, and monthly periodicals. The manufactures are varied and important, including shawls, knit goods, locomotives, agricultural implements, steel springs, stoves, brushes and brooms, flour, varnish, sashes, doors, and blinds, carriages, pumps, fire engines, electrical apparatus, etc. Pop. '90, 19,902.

SCHERER, EDMOND HENRI ADOLPHE, French theologian and critic, born in Paris, April 8, 1815. He studied theology in England and Strasburg, and in 1845 was appointed professor of exegesis at Geneva. Owing to changes in his religious convictions he resigned his professorship in 1850, and removed to Versailles, where he headed a liberal movement in the French Episcopal church, and after the establishment of the republic was a lifelong member of the senate. With Colani, he was for a long time editor of the *Revue de Théologie et de Philosophie Chrétienne*, later on the staff of the *Bibliothèque Universelle*, and contributor to the *Paris Temps*. He died at Versailles, March 16, 1889. His publications include: *Mélanges de Critique Religieuse* (1860); *Études sur la Littérature Contemporaine* (1863-95, 10 vols.); *Études Critiques de Littérature* (1876); *Diderot, Étude* (1880); *Melchior Grimm* (1880), and many others.

SCHERZO (Ital. jest, sport), in music. A term applied to a passage or movement of a lively and sportive character, forming a part of a musical composition of some length, as a symphony, quartet, or sonata.

SCHIEVENINGEN (pron. *Skäveningen*), a populous and thriving village in s. Holland, is situated on the coast of the North sea, about one mile from the Hague. Pop. '89, 17,277. Fishing is the chief industry. It is the most fashionable sea-bathing resort in the Netherlands, and is visited by many distinguished strangers, there being an excellent bath-house, and hotels. In the neighborhood are summer residences of the royal family and nobility. There are two roads from the Hague to Schieveningen, one of which, the "Oudeweg," is a long avenue of fine trees and wooded banks, with a tramway for passengers and goods.

SCHIAPARELLI, GIOVANNI, a distinguished Italian astronomer, best known for his observations, in planet Mars, of the so-called "double canals" which bear his name. He was born at Savigliano, March 5, 1835, was educated at the university of Turin, and pursued his astronomical studies at the observatories of Berlin and Pulkowa. He became in 1860 astronomer at the Milan observatory and two years later its director. In 1861 he discovered the planet *Hesperia*. Of his numerous important writings may be mentioned *The Relation between Comets and Falling Stars* (1871); *The Precursors of Copernicus in Antiquity* (1873); *Observations on the Movement of Rotation and the Topography of the Planet Mars* (1878-86).

SCHIEDAM, a t. in s. Holland, situated on the Schie, which is connected with the Maas by a canal. Pop. '96, 23,233. The streets are narrow, irregularly built, and, compared with other Dutch towns, have a dirty appearance, from the distilleries, malting-works, and grain-mills. It has churches, a synagogue, a theater, a gymnnasium, normal and other schools.

SCHILLER, JOHANN CHRISTOPH. FRIEDRICH VON, one of the greatest poetical geniuses of Germany, was b. at Marbach, a little town of Würtemberg, on Nov. 11, 1759. His father, Joh. Kaspar Schiller, was overseer of the nurseries attached to a country-seat of the duke of Würtemberg. Schiller received his first formal instruction from the parish priest Moser, at Lorch; and in 1773, the duke, who had formed a favorable opinion both of Schiller and his father, offered to educate the boy, free of expense, at the military academy founded by him at the castle of Solitude, and afterward transferred to Stuttgart under the name of Karls-schule. The offer was accepted, and entering the rigorous academy, Schiller tried to devote himself to jurisprudence. His success in the new study was small, and after two years he exchanged it for medicine. But literature, especially poetry, was the secret idol of his soul, and its chief delight. Already the characteristics of his genius—his tendencies toward epic and dramatic idealism—were showing themselves in his predilections. His first literary attempts of any moment were dramatic—*Der Student von Nassau* and *Cosmus von Medici*—which were consigned (doubtless not without reason) to the fire. Meanwhile, the poet's general intellectual culture and his professional studies went steadily on; and in 1780 he passed as a military surgeon, but with no liking for such a career. In 1778 Schiller completed the first sketch of his memorable drama, *Die Räuber* (The Robbers), the publication of which, in 1780, excited the most violent enthusiasm among the young all over Germany, so wild, and strong, and glowing were the passion and fancy displayed in it. Respectable people, dignitaries, functionaries and the like, were, of course, deeply scandalized; and the duke himself, a "serene highness" sort of man, was induced to lecture the poet on his delinquency, and forbade him to write any more poetry "without submitting it to his inspection!" In 1782 *The Robbers* was brought upon the stage at Mannheim—the poet being present without the knowledge of his superiors, the result of which was arrest for a fortnight! This led to further complications, and finally, in October of the same year, Schiller fled from the harsh service of the duke into Franconia, and lived for a year under a feigned name at Bauerbach, near Meiningen, where he completed his *Fiesco* and *Cabale und Liebe*, begun at Stuttgart. *Don Carlos* was also sketched in outline here. In Sept., 1783, he went back to Mannheim, and was for some time closely connected with actors and theatrical life. To this period belong several of his lesser poems. With the *Cabale und Liebe* above mentioned ended the first poetic period in Schiller's career, otherwise known as the *Sturm und Drang* period, in which a burning energy of passion and a robust extravagance, passing often into sheer bombast of speech, are the predominant characteristics. In Mar., 1785, Schiller left Mannheim and proceeded to Leipzig, where he became acquainted, among others, with Huber and Körner, and wrote his beau-

tiful *Lied an die Freude*; thence, after a few months, he went to Dresden, where he began the practice of composing during the night, which so fatally assisted in shortening his life. *Der Geisterseher* (The Ghost-seer), a strikingly powerful romance, was written here; and the drama of *Don Carlos* was completed. In 1787 he was invited to Weimar, and was at once warmly received by Herder and Wieland; but some years elapsed before Goethe and he could understand one another; after that, they became the closest friends. Henceforth, Schiller owed more to Goethe than to all other men: we may even call the later and best writings of Schiller inspirations of Goethe. The study of the spirit and literature of antiquity in particular exercised a wholesome influence over him, and in his *Götter Griechenlands* (Gods of Greece), which belongs to this stage, we see how calm, and clear, and sunny his once turbid and stormful imagination was gradually becoming. Reinhold of Jena introduced him to the Kantian philosophy, and for some little time Schiller was in danger of lapsing from a poet into a metaphysician. The philosophical and æsthetic treatises springing out of this new study were collected and published under the title of *Kleine prosaischen Schriften* (4 vols., Jena, 1792-1802). His *Geschichte des Dreissigjährigen Kriegs* (History of the Thirty Years' War) originally appeared in the *Taschenkalender für Damen* (1790-93). On the occasion of the poet's marriage in 1790 with Charlotte von Lengefeld, the duke of Meiningen made him a *hofrath* (privy-councillor); the French republic also conferred on him the right of citizenship; and in 1802 the emperor raised him to the rank of nobility. While staying for a year with his relatives in Würtemberg he wrote his exquisite *Briefe über ästhetische Erziehung* (Letters on Æsthetic Culture). This period, reaching to the close of 1794, is generally regarded as Schiller's transition period; in poetic accomplishment it is not rich, but in earnest, thoughtful, and manifold speculation it was highly important to the poet, and we find that it prepared the way for the last and most splendid development of his genius. After 1795 the finest of his lyrics and dramas were produced—as *Der Spaziergang* and the *Lied der Glocke* (Song of the Bell) in 1796, *Wallenstein* (1799), *Maria Stuart* (1800), *Die Jungfrau von Orléans* (1801), *Braut von Messina* (Bride of Messina, 1803), and finally, his greatest drama, *Wilhelm Tell* (1804). But his health had been long giving way, partly owing to a natural weakness of constitution, and partly to incessant application to study; and on May 9, 1805, he expired, at the early age of 46. Ever since his death the fame of Schiller has been on the increase; he has long been recognized as, next to Goethe, the greatest poet that Germany has produced, and innumerable editions of his works in whole or part have been published. The best account of him and his works is given by Carlyle in his *Life of Friedrich Schiller* (Lond. 1825). See Düntzer's *S.'s Leben* (1880).

SCHILLING, JOHANNES, b. Saxony, 1828; studied art at Berlin and Dresden. He resided for a number of years in Rome, and in 1868 was made professor at the Dresden royal academy of art. His most famous works are the group representing the seasons, now at Dresden; the Schiller monument at Vienna, and the later designed life-size figures on it; the group "Amor and Psyche;" the Grand National Monument on the Niederwald, and the statue of the Emperor William I. at Wiesbaden (1894).

SCHINKEL, KARL FRIEDR., a German architect of great celebrity in his own country, was b. at Neuruppin, Mar. 13, 1781, and studied the principles of drawing and design at Berlin under Prof. Gilly. In 1803 he went to Italy to extend his professional knowledge; but on his return in 1805 he found the aspect of public affairs so threatening that he could obtain little employment, and was forced to betake himself to landscape-painting. In May, 1811, he was elected a member of, and in 1820 a professor at, the Berlin academy of arts. Other offices and honors were also conferred on him. He died Oct. 9, 1841. The designs to which he chiefly owes his reputation are those of the royal guard-house, the memorial of the war of liberation, the new theater, the new Potsdam gate, the artillery and engineers' school, in Berlin; the casino in Potsdam; another in the gardens of Prince Karl at Bienenke, near Potsdam; and a great number of castles, country-houses, churches, and public buildings. Schinkel was a man of powerful and original genius; his designs are remarkable for the unity of idea by which they are pervaded, and the vigor, beauty, and harmony of their details. See Kugler's *Karl Friedr. Schinkel* (Berlin, 1842).

SCHINUS, a genus of trees and shrubs of the natural order *anacardiaceæ*, natives of South America. The leaves so abound in a resinous or turpentine-like fluid, that upon the least swelling of the other portions of the leaf by moisture it is discharged from the sacs which contain it. Thus they fill the air with fragrance after rain, or if thrown into water, start and jump about as if alive, discharging jets of this peculiar fluid. The same phenomenon is exhibited by the leaves of some species of the kindred genus *duraoia*, of which specimens are occasionally to be seen in our greenhouses. The leaves and twigs when bruised have a very strong odor of turpentine.

SCHIO, a t. in Italy, 12 m. n.n.w. of Vicenza, situated in a fertile plain between the rivers Leogra and Timonchio; pop. '87, 7392. It contains manufactories of woolen cloth, marble quarries, and silk, clay, and dye works. It is somewhat noted for its mineral springs, and has churches, hospitals, and other public buildings.

SCHISM, WESTERN, a celebrated disruption of communion in the western church, which arose out of a disputed claim to the succession to the papal throne. On the death of Gregory XI. in 1378, a Neapolitan, Bartolomeo Prignano, was chosen pope by the majority of the cardinals in a conclave at Rome under the name Urban VI. Soon afterward, however, a number of these cardinals withdrew, revoked the election, which they declared not to have been free, owing to the violence of the factions in Rome by which the conclave had, according to them, been overawed; and, in consequence, they proceeded to choose another pope under the name Clement VII. The latter fixed his see at Avignon, while Urban VI. lived at Rome. Each party had its adherents, and in each a rival succession was maintained down to the council of Pisa in 1410, in which assembly both were deposed, and a third pope, John XXIII., was elected. This measure not having been acquiesced in by all, a new council was convened at Constance in 1417, in which not alone the former rivals, but even the new pontiff elected, by consent of the two parties, at Pisa, were set aside, and Otho Colonna was elected under the name of Martin V. In this election the whole body may be said to have acquiesced; but one of the claimants, Peter de Luna, called Benedict XIII., remained obstinate in the assertion of his right till his death in 1430. The schism, however may be said to have terminated in 1417, having thus endured nearly 40 years.

SCHISMA, the name given to one of the very small intervals known in the theory of music, which amounts to the difference between the *comma ditonicum* and *comma syntonicum*. See **COMMA**.

SCHIST (Gr. *schistos*, split) is a term applied somewhat loosely to indurated clays, as bituminous schist and mica schist. It is more correctly confined to the metamorphic strata, which consist of plates of different minerals, as mica schist, made up of layers of quartz separated by laminae of mica; chlorite schist, a green rock in which the layers of chlorite are separated by plates of granite or felspar; and hornblende schist, a black rock composed of layers of hornblende and felspar, with a little quartz.

SCHIZ'OPHYTE, a microscopic organism belonging to Cohn's order *schizosporea*, and allied to bacteria, having so near a relation indeed as to be regarded as a variety of *bacillus*, or as a phase in the growth of this organism. See **GERM THEORY OF DISEASE**. But in whatever manner it may be classified, a certain kind of schizophyte is one of the organisms which are regarded as *disease germs*, and, as has probably been established, is the peculiar disease germ in the *swine plague* (q. v.) of this country. Whether it has any agency in the production of other diseases is uncertain, for whatever agency disease germs have in producing disease, the precise manner of communication has not been determined.

SCHLAGINTWEIT, HERMANN, ADOLF, and ROBERT, three brothers b. in Munich—Hermann 1826, and Adolf 1829; Robert, the youngest, in 1833. While at the university, the two older brothers made original researches, chiefly in the eastern Alps; in 1851 they explored the vicinity of Monte Rosa, the highest peak of which they were the first to ascend and measure accurately, finding its height 14,284 French feet. In 1854 the three brothers were sent out by the British East India company to continue the scientific survey of India. They ascended the Himalaya mountains, examining the glacier of Milun, 10 m. long and 3,000 ft. broad; crossing 4 passes about 18,000 ft. high; the peak of Gunshankor, 19,640 ft. high, near the sources of the Indus; and on the highest mountain of Thibet, reached an elevation of 22,260 feet. The whole extent of their travels was about 18,000 miles. Adolf, having determined to continue his researches, advanced alone into regions of Thibet and Turkistan never visited by any scientific traveler. He lost his life 1857, probably through the hostility and misapprehension of the native tribes. Hermann d. 1882; Robert, 1885.

SCHLANGENBAD, one of the most distinguished spas of Germany, on the northern frontier of the Rheingau district, 6 m. w. of Weisbaden, in a beautiful and secluded situation, embosomed amid wooded hills. The water of the baths has a temperature of 80° F., and contains the muriates and carbonates of lime, soda, and magnesia, with a slight excess of carbonic acid. The baths have a marvelous effect in beautifying the skin, and in soothing and tranquilizing. The village is itself very small, and the permanent population in 1895 was only 400.

SCHLATTER, MICHAEL, 1716-90; b. Switzerland; educated at St. Gall; was ordained and sent by the synods of Holland to the German Reformed emigrants in Pennsylvania; was pastor of the Reformed churches in Philadelphia and Germantown, 1746-51; and organized churches in Pennsylvania, New Jersey, Maryland, and Virginia. He assisted in organizing the synod of the German Reformed church in 1747; visited Europe in 1751, and returned with six other missionaries. In 1757 he was chaplain of an expedition to Nova Scotia against the French, and espousing the cause of the colonies at the outbreak of the revolution he was imprisoned in 1777.

SCHLEGEL, AUGUST WILHELM VON, a distinguished critic, poet, and scholar, was b. at Hanover, Sept. 8, 1767, and studied at Göttingen, where he acquired a reputation by his devotion to philological and classical studies. He first began to assume a prominent position in literature while a lecturer at Jena, contributing assiduously to Schiller's *Horen* and *Musen-Almanach*, and to the *Allgemeine Literaturzeitung*. About the same

time his translation of Shakespeare began to appear (9 vols. Berl. 1797-1810), the influence of which on German poetry and the German stage was equally great. Subsequently the poet Tieck, with Schlegel's consent, undertook a revision of the work, together with a translation of such pieces as Schlegel had omitted (12 vols. Berl. 1825, 1839, 1843); and from their conjoint labors the people of Germany are able to form a faithful idea of the surpassing genius of our countryman. Schlegel also delivered at Jena a series of lectures on aesthetics, and, along with his brother Friedrich, edited the *Athenæum* (3 vols. Berl. 1796-1800), which in spite of, perhaps because of, the severity of its criticism, gave a lively and wholesome impulse to the poetry of its time. He published besides his first volume of poems (*Gedichte*, Tüb. 1800); and, again in company with his brother, the *Charakteristiken und Kritiken* (2 vols. Königsb. 1801). In 1802 Schlegel left Jena for Berlin, where he gave a second series of lectures on literature, art, and the spirit of the time. Next year appeared his *Ion*, an antique tragedy of considerable merit. It was followed by his *Span. Theater* (2 vols. Berlin, 1803-9), consisting of 5 pieces of Calderon's, admirably translated, the effect of which has been to make that poet quite a favorite with the German people; and his *Blumensträusse der Ital., Span., und Portug. Poesie* (Berl. 1804), a charming collection of lyrics from the sunny south, from the appearance of which dates the naturalization in German verse of the metrical forms of the Romanic races. Probably his most valuable, and certainly his most widely popular work, was his *Vorlesungen über dramatische Kunst und Literatur* (3 vols. Heidelb. 1809-11), originally delivered at Vienna, in the spring of 1808, and translated into most European languages. During 1811-15 Schlegel published a new collection of his poems (*Poetische Werke*), which contains his masterpieces, "Arion," "Pygmalion," "St. Lucas," and is notable for the richness and variety of its poetic forms, as also for the singular facility and elegance of the versification. In 1818 Schlegel, now raised into the ranks of the nobility, and privileged to use the sacred *von* before his name, was appointed professor of history in the university of Bonn, and devoted himself especially to the history of the fine arts and to philological research. He was one of the first students of Sanskrit in Germany, established a Sanskrit printing-office at Bonn, and an *Indische Bibliothek* (2 vols. Bonn, 1820-26). Among the proofs of his scholarly activity in this department of knowledge may be mentioned his edition of the *Bhagavad Gita*, an episode from the epic poem *Mahābhārata*, with a Latin translation (2d ed. Bonn, 1846), and of part of the *Rāmāyana* (Bonn, 1829-39). His other works it is unnecessary to mention. Schlegel was not happy in his domestic relations. He was twice married, first to a daughter of Prof. Michaelis, of Göttingen, and again to a daughter of Prof. Paulus, of Heidelberg, but in both cases a separation soon became necessary. Schlegel was quarrelsome, jealous, and ungenerous in his relations with literary men, and did not even shrink from slander when his spleen was excited. He died May 12, 1845.

SCHLEGEL, KARL WILHELM FRIEDRICH VON, distinguished both for his scholarship and intellectual ability, was a brother of the preceding, and was b. at Hanover, Mar. 10, 1772. He studied at Göttingen and Leipsic, and in 1797 published his first work, *Griechen und Römer* (The Greeks and Romans), which won praise from old Heyne. It was followed in the course of a year by his *Geschichte der Poesie der Griechen und Römer* (History of Greek and Roman Poetry), a sort of fragmentary continuation of the former. Both of these productions bore evidence of rich learning, independent thought, and a thorough appreciation of the principles and method of historic criticism; but the chief vehicle at this time for the dissemination of his philosophical views of literature was the sharp-fanged periodical called the *Athenæum*, edited by himself and his brother, August Wilhelm. Proceeding to Jena, he started there as a *privat-docent*, holding lectures on philosophy, which met with great applause, and still editing the *Athenæum*, to which he also began to contribute poems of a superior quality, and in the most diverse meters. In 1802 appeared his *Alarkos*, a tragedy, in which the antique-classical and new-romantic elements are singularly blended. From Jena, he soon went to Dresden, and thence to Paris, where he gave a few more of those philosophical prelections, in the manufacture of which both he and August Wilhelm were unhappily much too expert; edited the *Europa*, a monthly journal (2 vols. Frankf. 1803-5); and applied himself assiduously to the languages of southern Europe, and still more assiduously to Sanskrit, the fruits of which were seen in his treatise, *Ueber die Sprache und Weisheit der Indier* (Heidelb. 1808). See PHILOLOGY. During his residence in Paris he also published a *Sammlung Romantischer Dichtungen des Mittelalters* (Collection of Mediæval Romantic Poems, 2 vols. Par. 1804), and the pious-chivalric romance of *Lothar und Maller* (Berl. 1805). On his return to Germany he published a volume of dithyrambic and elegiac poems (*Gedichte*, Berl. 1809). At Cologne, he passed over to the Roman Catholic Church, a change to which his mediæval studies powerfully contributed, and which, in its turn, no less powerfully affected his future literary career. In 1808 Schlegel went to Vienna, where, in 1811, appeared his *Ueber die neuere Geschichte* (Lectures on Modern History), and in 1815 his *Geschichte der alten und neuen Literatur* (History of Ancient and Modern Literature). In 1823 a collected edition of his writings, in 12 vols. (*Sämmtliche Werke*), was published by himself. Subsequently he delivered two series of lectures, one on the Philosophy of Life (*Philosophie des Lebens*, Vienna, 1828).

and another on the *Philosophy of History* (*Philosophie der Geschichte*, Vienna, 1829), both of which are well known in England and other countries through the medium of translations. Schlegel died Jan. 12, 1829. His MSS. were published by his friend Windischmann (2 vols. Bonn, 1836-37).

SCHLEICHER, a co. in w. Texas; unorganized; pop. '90, 155. Area, 1500 sq. m.

SCHLEICHER, AUGUST, 1821-68; b. Germany; educated at Leipsic, Tübingen, and Bonn. He was appointed professor of philology at Prague in 1850, and at Jena in 1857. As a comparative philologist his rank was second only to Bopp. Among his works are *Zur Sprachengeschichte* (1848-50); and *Compendium der Vergleichenden Grammatik der Indogermanischen Sprachen* (1861).

SCHLEIERMACHER, FRIEDRICH ERNST DANIEL, one of the greatest and most influential theologians of modern times, was born at Breslau, Nov. 21, 1768. His boyish years were spent in the school kept by the Moravian brotherhood at Niesky, and here he first received those religious impressions, the influence of which was visible in his whole after-life. In 1787 he proceeded to the university of Halle; and, on the conclusion of his academic course, acted for some time as a teacher; but in 1794 became assistant-clergyman at Landsberg-on-the-Warthe, where he remained for two years. He then went to Berlin, and occupied himself partly in the translation of some of Blair's and Fawcett's sermons, and in the redaction of the *Athenæum*, conducted by his friend Friedrich Schlegel; but the first work that won for him general celebrity was his *Reden über die Religion* (Discourses on Religion, Berl. 1799), which startled Germany from its spiritual torpor, vindicated the eternal necessity of religion, and sought to separate those elements of it that are essentially divine from the incrustations of dogma and the formalities of practice. Neander looked upon these *reden* as making the turning-point in his spiritual career. They are now regarded as both making and marking an epoch in the theological history of Germany. The *reden* were followed by the *Monologen*, and the *Briefe eines Predigers ausserhalb Berlin* in 1800. Two years later he was appointed preacher at the charity-house in the Prussian capital; and during 1804-10 produced his famous translation of Plato, with commentary, which is considered in Germany, to this day, the most profound and penetrating treatise on the philosophy of the great Athenian, though English scholars are disposed to regard its criticism as decidedly too subjective, and in many important respects baseless. In 1801 appeared the first collection of his *predigten* (sermons), followed between 1808 and 1833 by no fewer than six other collections. They are masterpieces of penetrating and eloquent discussion, appealing equally to the heart and the intellect of hearers and readers. In 1802 Schleiermacher went as court-preacher to Stolpe, where he published his *Grundlinien einer Kritik der bisherigen Sittenlehre*; and in 1804 was called to Halle as university-preacher, and professor of theology and philosophy. In 1807 he returned to Berlin, having previously published *Die Weihnachtsfeier, ein Gespräch* (Christmas festival, a dialogue, Halle, 1806), bearing on the calamitous state in which Germany then found herself, owing to the victorious insolence of the French. Among his next publications may be mentioned *Ueber den Sogenannten ersten Brief des Paulus an den Timotheus* (concerning the so-called first epistle of Paul to Timothy, Berl. 1807). In 1809 he became pastor of Trinity church, Berlin; and in 1810, when the university of Berlin was reopened, with a brilliant array of professors, under the rectorship of Fichte, no name shone more conspicuous than that of Schleiermacher. In 1811 he was chosen a member of the Berlin academy of sciences, in whose Transactions are to be found many valuable papers by Schleiermacher on the ancient philosophy, and in 1814 secretary of the philosophical section. In 1817 he was appointed president of the synod assembled in Berlin. His latest, and perhaps his most important work is *Der Christliche Glaube nach den Grundsätzen der Evang. Kirche im Zusammenhange dargestellt* (the Christian faith systematically presented according to the fundamental propositions of the evangelical church, 2 vols. Berl. 1821-22), in which his deepest and most Christian thought is visible. He died at Berlin, Feb. 12, 1834. The list of Schleiermacher's disciples—i.e., of men who have derived the groundwork of their principles from him—is one of the most splendid that any theological reformer could show, embracing, among others, the names of Neander, Nitzsch, Twisten, Olshausen, Lucke, Bleek, and Ullmann. In 1864 appeared a posthumous work of Schleiermacher, *Das Leben Jesu, Vorlesungen an der Universität zu Berlin im Jahr*, 1832, in which he conceives of Jesus as a man in whom the divine spirit works as perfectly as it possibly can in humanity, and treats his history accordingly. Strauss has replied in a critique (Berl. and Lond. 1865). Schleiermacher was very far from what in England is called orthodox, but he was a great, earnest, devout Christian man, of massive understanding, and whose eloquence was scarcely less golden than that of Plato himself. Germany overflows with literature on Schleiermacher, his system, and his ideas.—For an account of his earlier life, see the autobiographical sketch first published in Niedner's *Zeitschrift für historische Theologie* (1851); and for his later life, *Aus Schleiermacher's Leben in Briefen* (1858; translated by Frederica Rowan. See also Bender's *S.'s Theologie*; Lang's *Religiöse Charaktere*.

SCHLESWIG. See SLESWICK.

SCHLETTSTADT (French, *Schlestadt*), a t. of Alsace-Lorraine, on the left bank of the Ill, 27 m. s.s.w. of Strasburg. Till the war of 1870-71 Schlettstadt was a French fortress of the third class. It was bombarded and compelled to capitulate Oct. 24, 1870. The fortifications have been demolished. Pop. '95, 9304.

SCHLEUSNER, JOHANN FRIEDRICH, D.D., 1756-1831; b. Leipsic; studied theology and philosophy in Leipsic university; professor of theology in Göttingen in 1784; professor of theology, and provost of the college church in Wittenberg in 1795. His principal works are *Lexicon Græco-Lat. in Novum Testamentum* (2 vols.); *Thesaurus, sive Lexicon in LXX.* His lexicon on the Septuagint continues to be a standard work. He edited with Ständlin the *Göttingische Bibliothek der Neuesten Theologischen Literatur*.

SCHLEY, a co. in s.w. Georgia; drained by Muckalee creek, and other branches of the Flint river; about 163 sq.m.; pop. '90, 5443, includ. colored. The surface is level. There are great forests. The soil is fertile. The principal productions are cotton, corn, rice, and molasses. Co. seat, Ellaville.

SCHLEY, WINFIELD S., b. Md., 1839; entered the navy as a midshipman, 1856, and was at the naval academy till 1861; was then appointed master, and assigned to the "Potomac." Afterwards he was with the gulf blockading squadron, and in 1863 was at the capture of Port Hudson. He subsequently served in the Pacific squadron, and in 1874 was appointed commander. In 1884 he was selected to command the polar expedition sent to the rescue of Lieut. Greely; promoted captain, 1888; appointed light-house inspector (1892), and commander of the "New York," 1895.

SCHLIEHMANN, HEINRICH, b. Germany, 1822; son of a Lutheran pastor, who inspired him at an early age with an enthusiastic admiration of the heroes of ancient Greece. His mother died when he was nine years old, and he then lived for two years with his uncle at Kalkhorst. At fourteen he was compelled to enter a grocer's shop at Fürstenburg to support himself. He remained in that humble position for over five years, when he obtained a position as clerk in the Amsterdam firm of B. H. Schroeder and Co. In 1846 he was sent to St. Petersburg by his firm as their local agent, and a year later established there a business of his own. In the course of a busy life he traveled extensively in Europe and America, and acquired many languages. After he had amassed wealth he commenced his archaeological investigations and excavations in the east, and published, in 1869, *Ithaque, Le Péloponèse, Troie; Recherches Archéologiques*. In 1874 he published *Troy and its Remains*, containing an account of his discoveries at Hissarlik. In 1874 he obtained permission from the Greek government to excavate Mycenæ, where, in 1877, he made the marvelous discovery of the five royal tombs, which local tradition pointed out to Pausanias as those of Agamemnon and his companions, who were murdered by Ægisthus. He then wrote in English, *Mycenæ; a Narrative of Researches and Discoveries at Mycenæ and Tiryns*. In his explorations Dr. Schliemann was very greatly assisted by his wife, a native of Greece. Dr. S. died in 1890. See ARCHÆOLOGY: TROY.

SCHLOSSER, FRIEDR. CHRISTOPH, a distinguished German historian, was b. at Jever, Nov. 17, 1776, educated at Göttingen, and after spending many years as a private tutor and academic teacher, he was, in 1817, called to Heidelberg as a professor of history, where he died, Sept. 23, 1861. His principal writings (arranged in the order of time) are *Abälard und Dulcin* (Gotha, 1807); *Leben Beza's und des Peter Martyr Vermili* (Heidelb. 1809); *Geschichte der Bilderstürmenden Kaiser des Oeström. Reichs* (Frankf. 1812); *Weltgeschichte in Zusammenhängender Erzählung* (Frankf. 1817-24); *Geschichte des 18 Jahrh.* (Heidelb. 1823); *Universalhistorische Uebersicht der Geschichte der Alten Welt und ihrer Cultur* (Frankf. 1826-34); *Weltgeschichte für das Deutsche Volk* (1844-53); and *Studien über Dante* (1856). Of these works, the most notable are the *Geschichte des 18 Jahrh.*, continued by Schlosser in the later editions till the fall of Napoleon, and the *Weltgeschichte für das Deutsche Volk*, which have been translated into English and other tongues. Schlosser is a keen, critical, and powerful writer, who judges men and events by a stern ethical standard.

SCHMALKALD, LEAGUE OF, the name given to the defensive alliance concluded provisionally for nine years at Schmalkalden (q.v.), Feb. 27, 1531, between 9 Protestant princes and 11 imperial cities, with whom other 5 princes and 10 imperial cities subsequently made common cause; and the elector of Saxony and the landgrave of Hesse were appointed chiefs of the league, and empowered to manage its affairs. The object of this formidable alliance, which included the whole of northern Germany, Denmark, Saxony, and Württemberg, and portions of Bavaria and Switzerland, was for the common defense of the religion and political freedom of the Protestants against the emperor Charles V. and the Catholic states. The league was not rendered superfluous by the religious peace of Nürnberg in 1532, and on the rumor that the emperor was meditating new hostile measures against the Protestants, another meeting of the confederates was held Dec. 24, 1535, which resolved to raise a permanent army of 10,000 foot and 2,000 cavalry, and to prolong the league for ten years. The confederation was further consolidated by articles of guaranty which were drawn up by Luther at Wittenberg in 1536, and being subscribed by the theologians present at the meeting of the league at Schmalkalden in Feb., 1537, were called the *Articles of Schmalkald*. Against the league the emperor, engaged as he was at the time in contests with the Turks and French, found himself unable to contend, though supported by the holy league, a Catholic confederation formed in 1538, in opposition to the Protestant one. But impolitic management, mutual jealousies, and

conflicting petty interests dissipated their energies, and prevented their united action. The "war of Schmalkald" commenced by the advance of the army of the league, under Sebastian Schärtlin, into Suabia, to bar the approach of the imperial army from Italy. Schärtlin forced his way to the banks of the Danube, but the miserable jealousy of the Saxon princes paralyzed his action. The emperor, by a proclamation bearing date July 20, 1540 put the two chiefs of the league under the ban of the empire; Maurice, duke of Saxony, took possession of the electorate, by virtue of an imperial decree; and the Protestant army was forced to retreat. The elector of Saxony reconquered his electorate in the autumn of 1546, but meantime the imperial army subdued the northern members of the league of Schmalkald, and advanced into Franconia to meet the combined armies of Saxony and Hesse. The latter were totally routed at Mühlberg (April 24, 1547), and both chiefs fell into the emperor's hands. This defeat, which has been ascribed to treason, and was perhaps as much owing to this cause as to weakness, finished the war. The object of the league, the guaranty of the liberty of religion to the Protestants, was subsequently effected by Maurice, now elector of Saxony, who, by a brilliant feat of diplomacy and generalship, compelled the emperor to grant the treaty of Passau (July 31, 1552), by which this freedom was secured.

SCHMALKALDEN, an old and interesting t. of Hesse-Nassau, Prussia, at the confluence of the Stille and Schmalkald, 18 m. s.w. of Gotha. It is surrounded with double walls, contains two castles, and carries on considerable mining operations, especially in iron, and various manufactures, the chief of which are hardwares. Pop. '95, 7888.

SCHMID, LEOPOLD, 1808-69; b. Zurich; studied theology at Munich and Tübingen; appointed professor of theology at Giessen in 1839, and subsequently of philosophy. Though a Roman Catholic he was opposed to the ultramontane party. He was elected bishop of Mentz in 1849, but the pope refused to confirm him. He published *Der Geist des Katholicismus oder Grundlegung der Christlichen Irenik*, 2 vols.; *Ultramonian oder Katholisch*.

SCHMIDT, HENRY I., S.T.D., b. Penn., 1806; educated at the Moravian pædagogium and the theological seminary at Nazareth, Penn.; pastor of Lutheran churches in New Jersey 1831-33; professor at Hartwick seminary, N. Y., 1833-36; pastor of a German church in Boston 1836-38; professor at Gettysburg, Penn., 1838-43; pastor of Lutheran churches in Montgomery co., N. Y., 1844; principal of Hartwick seminary, 1845-47. He was professor of the German language and literature in Columbia college, New York, 1848-80. He published *History of Education and Plan of Culture and Instruction*; *The Scriptural Character of the Lutheran Doctrine of the Lord's-Supper*; *Course of Ancient Geography*. He died in 1889.

SCHMITZ, LEONHARD, PH.D., LL.D., b. Germany, 1807; studied history and philology at the university of Bonn; became professor in a gymnasium of that city; went to England 1836; rector of the high school at Edinburgh 1845-66; classical tutor to the prince of Wales 1859, and to prince Alfred, 1862-63; principal of London international college 1866-74, afterward classical examiner in the university of London; translated into English Niebuhr's lectures and Zumpt's *Latin Grammar*; contributed to Dr. Smith's classical dictionaries and to cyclopædias; and published Latin and Greek grammars and a series of histories for colleges and schools. He d. 1890.

SCHMUCKER, SAMUEL S., D.D., 1799-1873; b. Md.; educated at Princeton college, obtained a Lutheran minister in 1818; pastor of a church in Newmarket, Va., 1820-26; professor of didactic theology in Gettysburg theological seminary 1826-64, and also president. On his resignation he was made emeritus professor. The following are some of his publications: *Christian Temple*; *Formula of Government and Discipline*; *Plea for Sabbath-school System*; *Elements of Popular Theology*; *Discourse in Commemoration of the Glorious Reformation*; *Appeal on Christian Union*; *Retrospect of Lutheranism*; *Psychology*; *Capital Punishment*; *Christian Pulpit*; *Church Development*. He edited *Evangelisches Magazin*; contributed to *Biblical Repository* and other reviews.

SCHNAPPS, is another name for Holland gin (see GIN); also called "hollands," because it was manufactured originally in Holland. It is still produced in large quantities at Schiedam (q.v.), and for this reason is frequently called "Schiedam schnapps." It is an alcoholic liquor distilled from rye and barley, and flavored with juniper.

SCHNEE-KOPPE, the culminating point of the mountain chain of the Riesengebirge. See BOHEMIA.

SCHNEIDER, HORTENSE CATHERINE, b. France, 1835; a French actress who played at the age of fifteen at the *Athénée* of Bordeaux. She then received instruction in singing, and played for three years at Agen in secondary parts. After that she obtained an engagement at the Bouffes-Parisiens of Paris; and in 1856 made her début in *Le Chien de Garde* at the *Théâtre des Variétés*, where in 1864 she achieved a great success by her acting in *La Belle Hélène*. She appeared in *La Grande Duchesse de Gérolstein* in 1867 in which she had great popularity, and retired in 1881.

SCHNEIDER, JOHANN GOTTLÖB, 1750-1822; b. Saxony; educated at Leipsic, where he devoted himself to classical literature and philology. In 1774, in association with Brunk, he prepared an edition of the Greek poets, and two years later was made professor at Frankfort-on-the-Oder. In 1811 he went with the university to Breslau. Besides a num

ber of works on natural history, and editions with notes of various Greek writers, he published, 1797-98, a critical dictionary of the Greek language.

SCHNETZ, JEAN VICTOR, 1787-1870 ; b. France ; studied painting with David, Gros, and Regnault. He painted many religious and historical pictures, of which the best-known, perhaps, are "Christ Calling little Children unto Him," "The Monk Engaged in Prayer," and "The Gypsy Foretelling the Future of Sixtus V."

SCHNITZLER, EDWARD. See **EMIN PASHA.**

SCHNORR VON KARLSFELD, JULIUS, 1794-1872 ; b. Leipsic ; received his first instruction from his father an eminent painter, studied in the academy of painting at Vienna ; went to Rome, 1815, and attached himself to the school of young German artists under the auspices of Cornelius and Overbeck. Considered one of the most promising of this band, he was chosen with Cornelius and Overbeck to paint the walls of the villa Massini at Rome in fresco with designs from Dante, Ariosto, and Tasso. Ludwig, king of Bavaria, employed him to decorate his great works at Munich. Schnorr's greatest works were the frescos from the ancient German poem *Nibelungen Lied* for the new palace, and the historical paintings in encaustic in that part of the palace called *Fest-Saalbau*. He was appointed professor of historical painting in the academy of the fine arts at Munich, 1827, and in 1846 professor of the fine arts, and director of the picture gallery in Dresden.

SCHËLCHER, VICTOR, b. France, 1804 ; educated at the college Louis-le-Grand. He was an early advocate of the abolition of slavery, and studied the question in Mexico, Cuba, and the United States in 1829. In 1848, as under-secretary for the navy, he secured the passage of a law abolishing slavery in the French colonies. He was returned to the constituent assembly for Guadaloupe and Martinique, and to the legislative assembly for the former. Expelled from France after the *coup d'état*, he remained in England till the fall of the second empire, when he returned to France, and during the siege of Paris commanded the artillery of the national guard. In 1871 he was returned to the national assembly for the department of the Seine, for Guiana, and for Martinique, and took his seat for the latter. He was afterward elected a life senator. He is a member of the extreme left. He has published several books on slavery, a *Life of Händel* and *The Sunday Rest* (1870). He d. 1893.

SCHÖFFER, or SCHAFFER, PETER, abt. 1430-1503 ; b. Gernsheim ; began life as a copyist in Paris, afterward employed by Guttenburg and Faust, printers, at Mainz. He is said to have "discovered the more easy method of casting types." In 1455 Guttenburg retired, and he became a member of the firm with Faust ; the latter died 1466, and he carried on the business alone. His name appears with Faust's at the end of the Psalter, 1457. He married the daughter of Faust, and had three sons, all printers ; John Schöffer succeeded him.

SCHOFIELD, JOHN McALLISTER, b. N. Y., 1831 ; graduated at West Point 1853, and was commissioned in the artillery. He was for some years instructor in natural philosophy at West Point, and afterward at Washington university, St. Louis. At the beginning of the civil war he held the rank of capt. ; was made chief-of-staff to Gen. Lyon, and was with him at Wilson's Creek. In 1861 he was placed in command of the Missouri militia, and in the next year of that military district. He defeated Hindman near Pea Ridge, Ark., Oct., 1862, and drove the confederate forces back to the Arkansas valley. In 1864 he was made a brig. gen. in the regular army after most valuable services under Gen. Sherman in the Atlanta campaign and in the movements leading to the surrender of Johnston. Later he was in command at the battles of Franklin and Nashville, and captured Wilmington and Goldsborough, N. C. He was brevetted maj. gen. 1865 ; in 1867 was in charge of the Virginia district ; was secretary of war, 1868-69 ; assigned to command the Missouri military department, 1869 ; assigned to Pacific department, 1870 ; supt. West Point academy, 1876-81 ; commanded military depart. Pacific, 1882-83 ; of Missouri, 1883-86 ; of the East, 1886-88 ; commander of the army, 1888-95 ; appointed lieut. -gen. and retired, 1895, being succeeded by General Miles.

SCHOHARIE, a co. in e. New York, intersected by the Delaware and Hudson, the Middleburg and Schoharie Valley, and other railroads ; 647 sq. m. ; pop. '90, 29,164, chiefly of American birth, with colored. It is drained by Schoharie, Catskill, and Cobleskill creeks. Its surface is hilly ; the Catskill mountains occupy the s. and w., and the Helderberg the e. portion. It is largely covered with forests of oak, hickory, and ash in the highlands ; and groves of sugar-maple and elm by the rivers. In the n. w. sulphur springs are found, and it contains extensive ledges of Helderberg limestone and sandstone. The soil is fertile, producing grain, potatoes, hops, maple sugar, dairy products, etc. Live stock is raised. Co. seat, Schoharie.

SCHOLARSHIP, a benefaction, generally the annual proceeds of a bequest permanently invested, paid for the maintenance of a student at a university. At the university of Oxford there are 37, and at Cambridge 43, scholarships ; their values ranging from £20 to £100 per annum. In both universities the scholars are chosen from the undergraduates, and are often elected before they have begun their attendance at the university. They are on the foundation, but their connection with the college is not so intimate as that of the fellows. The regulations under which they are placed, and the advantages

which they enjoy, differ in the different colleges. A number of the scholarships which were formerly restricted have recently been thrown open to public competition. The bursaries (q.v.) of the Scottish universities are nearly analogous to the scholarships of the English and American. See UNIVERSITY.

SCHOLASTICS, or **SCHOOLMEN**, originally the name given to the teachers of rhetoric at the public schools under the Roman empire, but now used almost exclusively to denote the so-called philosophers of the middle ages. After the fall of the old classic civilization there ensued a long anarchy of barbarism, lasting from the 6th to the 8th c.; but from the time of Charlemagne a visible improvement took place. That great monarch encouraged learning; and the monasteries as well as the schools which he established, became subsequently the seats of a revived culture of philosophy. Conformably, however, to the spirit of a time in which learning and literary skill were confined to churchmen, philosophical activity showed itself chiefly in the domain of theology. This preparatory period of scholasticism—say from the 9th to the 11th c.—embraces the distinguished names of Johannes Erigena Scotus (see ERIGENA), who cannot, however, be properly classed among the scholastics; Gerbert of Aurillac, afterward pope Sylvester II. (q.v.); Berengarius (q.v.) of Tours; and Lanfranc (q.v.), Archbishop of Canterbury. A further development of scholasticism occurred toward the middle of the 12th c., when Roscelinus opened up the question concerning the nature of universal conceptions, which led to the great struggle between the *Nominalists* and *Realists* (see NOMINALISM), which terminated in the triumph of the latter; and henceforth, during the golden age of scholasticism (the 12th and 13th centuries) it continued to be the prevalent mode of thought in philosophy. Still, however, scholasticism regarded philosophy as dependent on theology. No one dreamed of doubting, or at least of disputing, the truth of any of the church doctrines. These were alike too sacred and too certain to be so handled, and the only thing left for a humble philosopher to do was, in fact, to sort and systematize them; hence the expression *philosophia theologie ancilla* (philosophy is the handmaid of theology), which has found its way down to modern times. Whatever did not directly belong to ecclesiastical dogma was either neglected or treated in accordance with the vague traditions of Platonic or Aristotelian thought handed down from antiquity. Hence sprang that vast array of artificial subtleties and distinctions which had no better foundation to rest on than gross ignorance of the matters discussed, combined with a restless speculativeness. The formulas of logic were abused through an irrational realism, which regarded them not only as a means to the attainment of philosophical knowledge, but as the material organon of philosophy itself. At first the dialectic treatment of dogma was only fragmentary, as we see it in the principal scholastics of the 12th c., Gilbert de la Porrée, Alanus ab Insulis, and Petrus Lombardus (see LOMBARD, PETER). During the 12th c., however, the increased intercourse of the west with the Arabs and Greeks led to a more definite acquaintance with the physical and metaphysical writings of Aristotle, though still only through incomplete translations, and thus the circle of vision of the scholastics widened, if it did not become clearer. From this period dates the almost *papal* authority of the great Stagirite in philosophy, and the rise of the vast and elaborate systems of mediæval theology. The three chiefs of scholasticism in this, its highest development, were Albertus Magnus (see ALBERT OF BOLLSTÄDT), Thomas Aquinas (q.v.), and Duns Scotus (q.v.); around each of whom stand groups of more or less independent scholars and followers. The celebrity of such teachers was largely increased by the want of books, which compelled their pupils to rely upon their oral communications, and necessitated those extraordinary public disputations which were the only means "philosophers" had of advertising their wares in the middle ages. The honor paid to them by their admirers is visible in the epithets attached to their names; thus Alanus is the *doctor universalis*; Alexander of Hales (q.v.), the *doctor irrefragabilis*; Duns Scotus, the *doctor subtilissimus*; Thomas Aquinas, the *doctor angelicus*; Guillaume Durand of St. Pourcain, the *doctor resolutissimus*, etc.

With Thomas Aquinas and Duns Scotus scholasticism culminated. After their time, various causes co-operated to bring about its decline and fall. The mystical theology (see MYSTICISM) gradually developed its natural antagonism to speculation resting on a basis of formal logic, and not appealing to the human heart and spirit. Such men as St. Bernard (q.v.) of Clairvaux, and the monks of St. Victor at Paris, in the 12th c., together with Bonaventura in the 13th, were unconsciously hostile to the dominant style of thought; while in the 14th and 15th centuries Tauler, Thomas à Kempis, Gerson, Nicholas of Clemangis, and others, deliberately set themselves against it. The very nature of the scholastic thought was inimical to its own perpetuity. The hyper-logical, hair-splitting course which it followed produced rival systems, and results discordant with the doctrines of that theology which it undertook to support, until it finally laid down the astounding proposition, that a thing might be philosophically true and theologically false, and *vice versa*. The quarrels of the two great orders—the Dominicans and the Franciscans—each of which took part with its metaphysical chief; the former being called Thomists (from Aquinas), and the latter, Scotists (from Duns Scotus), materially injured the common cause of scholasticism; and the revival of nominalism under William of Occam (q.v.), its most distinguished advocate, powerfully contributed to the same result; but it was not till after the revival of letters had done its work of

enlightening the judgment and purifying the taste of Europe, that scholasticism was visibly in danger. The reformation shook the system to its foundations—Luther himself leading the assault with the strength and valor of a cœur-de-lion; but still, so tenaciously did it cling to the semblance of life, that in the universities it held its footing till the 17th c., and even later.

SCHOLIASTS. A name applied to early annotators of classical and more especially of Greek manuscripts; the scholia or notes (from Gr. *scholē*, "leisure") were originally brief marginal notes made at spare moments upon some point of grammar or prosody, or some curious philosophical or historical question. The later scholiasts, however, extended their notes to such length that the term quite lost its original significance. Collections of the more important scholiasts have in modern times frequently been made and edited, as of Aristarchus, Didymus, Apollonius, Nicanor, and others on the Iliad, first published in 1819, and on the Odyssey, published 1821.

SCHOLL, AURÉLIEN ANTOINE, French journalist and man of letters, born at Bordeaux July 14, 1833. He was educated at the college of Bordeaux, went to Paris and at the age of seventeen began writing for the *Corsaire*. He was afterwards successively connected with the *Paris*, the *Mousquetaire* of Alexander Dumas, the *Illustration* and the weekly *Figaro*. After leaving the *Figaro* he established the *Nain Jaune*, and later *Le Club*, *Le Jockey* and (in 1869) *Le Lorgnon*. He was on the staff of the *Événement*, 1872–82, editor-in-chief of the *Voltaire*, 1882–83, and of the *Écho de Paris*, 1883–85. His publications are very numerous, among which the most clever and piquant are his *L'Esprit du Boulevard* (1883, 3 vols.); and *L'Amour appris sans Maître* (1891). In 1851 he published a volume of poems under title of *Denise*. Of his many contributions to the stage (partly in collaboration), may be mentioned, *Jaloux du Passé* (1861); *La Question d'Amour* (1864); *Les Chânes de Fleurs* (1866); *L'Hôtel des Illusions* (1869); *Le Nid des Autres* (1878); *L'Amant de la Femme* (1890).

SCHOLTEN', JOHANNES HENDRIK, 1811–85; b. at Vleuten, near Utrecht, Netherlands; was minister at Meer Kerk 1838–40; professor of theology at the atheneum of Franeker 1840–43, when he was appointed to the university of Leyden. He was the founder of a new school of Dutch theology which claims independence in applying scientific principles. He published *Geschiedenis der Gods Dienst en Wijs Begeerte*; *De Leer der Hervormde Kerk in Hare Grondbeginselen*, 2 vols.; *De Vrye wil Critisch Onderzoek*; *Het Evangelie Naar Johannes*; *De Oudste Getuigenissen Aangaande de Schriften des Nieuwe Testaments*; *Supernaturalisme in Verband mit Bijbel, Christendom en Protestantisme*.

SCHOMBERG, FREDERICK HERMANN, Duke of; 1616–90; b. Heidelberg, Germany; son of count Schomberg and a daughter of lord Dudley; began his military career in the Swedish army during the thirty years' war, and was punished by the emperor for the part he took by confiscation of his property; entered then the service of the Netherlands under Frederick, prince of Orange; afterward went to France, where, 1650–85, he distinguished himself, and rose to the rank of marshal. In the campaign with Spain he compelled that country to recognize the Portuguese dynasty of Braganza, for which he received a pension of £5,000 from the kingdom of Portugal, with reversion to his heirs. In 1685 the revocation of the edict of Nantes drove him elsewhere. After going to Portugal and Holland he went to the elector of Brandenburg, and was chosen commander of his forces; joined the prince of Orange, 1688, in his descent upon England, and was made commander of his forces. The next year he was made baron, earl, marshal, and duke, and received £100,000 from the house of commons. In August he was sent to Ireland to oppose James II., but by his inaction lost half his army. He fought bravely at the battle of the Boyne, but was killed while leading a body of French Protestants across the river.

SCHOMBURGK, SIR ROBERT HERMANN, a celebrated traveler, was born at Freiburg in Prussian Saxony, June 5, 1804. He began at an early age to apply himself to geographical science and natural history, and subsequently made an abortive attempt to succeed as a tobacco manufacturer in Virginia. In 1830 he went to Aneгада, one of the Virgin isles, and having, by the advice of the governor, carefully surveyed the island, and laid a report before the royal geographical society, he was charged by that learned body with the survey of Guiana in 1835. This enterprise, which was surrounded with formidable difficulties, he satisfactorily achieved, and from time to time laid the results of his investigations before the society, in whose *Journal* they were regularly published. It was during this exploration, and while he was ascending the Berbice river, that he discovered, Jan. 1, 1837, the magnificent aquatic plant denominated the *Victoria regia* (q. v.). On his return to England in 1839, he was presented with the medal of the geographical society for his *Travels and Researches in British Guiana in 1835–39* (Lond. 1840), a work which largely contributed to almost every branch of natural science. In 1840 he returned to Guiana, this time under the auspices of the British government, to complete his survey of that country, and survey the boundary line between it and Brazil; and on his return in 1844, after the completion of his labors, he received the honor of knighthood. His boundary line between Venezuela and British Guiana led to a threatening controversy between Venezuela and Great Britain in 1895–6, and the appointment by Pres. Cleveland of a commission to report on the true boundary. The *Description of British Guiana*, a valuable work, was the fruit of this expedition. In 1847 he published an excellent and elaborate *History of Barbadoes*, and in the following year departed for

San Domingo, whither he had been accredited as British consul and representative. In 1857 he was appointed British representative to the Siamese court. He returned ill in 1864, and died next year.

SCHÖNBEIN, CHRISTIAN FRIEDRICH, a German chemist, was born at Mitzenen in Würtemberg, Oct. 18, 1799; studied natural science at Tübingen and Erlangen, and in 1824-25 taught chemical physics at Keilhau, near Rudolstadt. To increase his knowledge, he visited England in 1826, repairing thence to Paris; and in 1828 he was called to a chair in the university of Basel, where his eminent qualifications were speedily recognized. In 1839 he discovered *ozone* (q.v.), and invented *gun-cotton* (q.v.) in 1845, obtaining from it by dissolution in ether the material called collodion (q.v.). In his later years he confined himself chiefly to experiments with oxygen. Of his works, which generally first appeared in periodicals, the chief are: *Das Verhalten des Eisens zum Sauerstoff* (Basel, 1837), *Beiträge zur Physikalischen Chemie* (Basel, 1844), *Ueber die Erzeugung des Ozons* (Basel, 1844), *Ueber die langsame und rasche Verbrennung der Körper in Atmosphärischer Luft* (1845). He died in 1868.

SCHÖNBRUNN, a royal palace in the outskirts of Vienna (q.v.), the summer residence of the imperial family.

SCHÖNEBECK, a manufacturing t. of Prussia, 8 m. s.s.e. of Magdeburg, on the left bank of the Elbe. The chemical works, the salt refineries, where the brine obtained from the abundant salt springs is boiled down, and salt made, and the breweries and distilleries are the principal industrial establishments. There are also manufactories of white lead. Pop. '95, 14,811.

SCHÖNGAUER, or SCHÖN, MARTIN, painter and engraver; b. Colmar, Upper Alsace, between 1445 and 1450; d. at Colmar, 1488. His father, a native of Augsburg, was a goldsmith, and settled in Colmar about 1465. Martin studied under him, and afterwards under Roger van der Weyden in Flanders. He was styled *Hübisch Martin* ("Martin the Beautiful"), by his contemporaries. He engraved many plates from his own compositions, and left several paintings, the most authentic of which is the "Virgin of the Rose Garden," at Colmar. See illus., KAULBACH, ETC.

SCHOOLCRAFT, a co. in upper Michigan, bounded on the n. by lake Superior, on the s. by lake Michigan; drained by Manistee and White Fish rivers; about 1216 sq.m.; pop. '90, 5818. The surface is uneven and heavily timbered. The soil is fertile. The principal productions are lumber and iron. The soil is not, as yet, extensively cultivated. In the n. is a sand-wall 300 ft. high, and several m. in length, called "The Pictured Rocks." Co. seat, Manistique.

SCHOOLCRAFT, HENRY ROWE, American author, geologist, and ethnologist, was born at Watervleit (now Guilderland), N. Y., March 28, 1793. He entered Union college in his 15th year, and studied French, German, Hebrew, chemistry, and mineralogy. In 1817-18 he visited the mining region w. of the Mississippi, sent a collection of minerals and geological specimens to Washington, and wrote *A View of the Lead Mines of Missouri*, etc. (8vo, New York, 1819), and a narrative, since enlarged, entitled *Scenes and Adventures in the Semi-alpine Region of the Ozark Mountains of Missouri and Arkansas* (8vo, Philadelphia, 1853). In 1820 he was appointed geologist of an exploring expedition to the copper regions of lake Superior and the upper Mississippi. He was afterward secretary of a commission appointed to investigate Indian claims and negotiate treaties, at Chicago. As the result of these labors, he made a report to the government, and wrote also *Travels in the Central Portion of the Mississippi Valley* (8vo, New York, 1825). In 1823 he was appointed Indian agent for the north-western frontier, and established himself at Sault Ste Marie. In 1823 he married Miss Johnston, granddaughter of an Indian chief, who had been educated in Europe. At this period, being in intimate relations with many Indian tribes, he devoted himself to the study of their history and ethnology. From 1828 to 1832 he was an active member of the legislature of Michigan territory, and founded its historical society, and the Algic society of Detroit. For his lectures on the Indian languages he received the gold medal of the French Institute. Adding poetry to science, he wrote: *The Rise of the West; Geehale, an Indian Lament; Indian Melodies; The Man of Bronze, or Portraits of Indian Character; Iosco, or the Vale of Norma*; also a grammar of the Algonquin language. In 1832 he was appointed to the command of an expedition which discovered the sources of the Mississippi, the *Narrative* of which was published (8vo, New York, 1834). As superintendent and disbursing agent for the Indians, he negotiated treaties by which the government acquired lands to the extent of 16,000,000 acres. He visited Europe in 1842, and the following year he made a tour, chiefly for the observation of Indian antiquities in western Virginia, Ohio, and Canada. In 1845 he collected the statistics of the Six Nations, and published *Notes on the Iroquois*, etc. (8vo, Albany, 1848). In 1847 the United States congress authorized his publication of *Historical and Statistical Information Concerning the History, Condition, and Prospects of the Indian Tribes of the United States*, in six volumes quarto, with 336 plates by Major Eastman and others (Philadelphia, 1851-57). He also published *Algic Researches; Thirty Years with the Indian Tribes of the North-western Frontier; The Indian in his Wigwam*, etc. In 1847 he was married, for the second time, to Miss Howard of South Carolina. He died in 1864.

SCHOOLEY'S MOUNTAIN, a village in Washington tp., Morris co., N. J., on a high plateau 20 m. long, and varying in width from one to two m.; 1200 ft. above sea-level. It is about 18 miles w. of Morristown and 3 miles from Hackettstown. The village has large hotels, boarding-houses, a church and a seminary. A chalybeate medicinal spring, which is said to be beneficial in kidney complaints and similar diseases, with a salubrious climate, have made it for many years a popular and fashionable summer resort.

SCHOOL MASTER, ARMY and NAVY. At all posts, garrisons, and permanent camps, are established schools, in which enlisted men are instructed in English branches, and in U. S. history. Teachers are selected from the army, are under the control of the post commander, and are not to exceed one for each company; they are allowed 35 cents a day extra, and have to attend parades and drills to keep them in training. There are also schools for the children of the soldiers; children of the enlisted men at the post are compelled to attend, but the attendance of officers' children is optional.

SCHOOLMEN. See SCHOLASTICS.

SCHOOLS. See COLLEGES, AMERICAN; COMMON SCHOOLS; INDUSTRIAL SCHOOLS; also, EDUCATION; NATIONAL EDUCATION.

SCHOOLS, BROTHERS OF CHRISTIAN, a religious congregation in the Roman Catholic church, established for the religious and secular education of the poor. It originated in France in the end of the 17th c., and was organized by a charitable ecclesiastic, the abbé de la Salle, canon of the church of Rheims. The members are all lay brothers, and are subject to one general head. Houses of the order are found in almost every country of Europe. In France this congregation was one of those which were specially excepted from among the suppressed orders, and which were re-established in France by gen. Bonaparte in the concordat of 1801. It continues to flourish in that country, as also in Belgium, Italy, Southern Germany, Great Britain, and North America. The brethren are bound by the ordinary religious vows of poverty, chastity, and obedience. Their system of education has received the highest testimonies, and they still form one of the most flourishing of all the lay orders in the Roman church, numbering, it is said, nearly 3,000 members. Besides this order, which is of French origin, similar institutes have been formed under the same or analogous names in other countries, the several varieties of which it would be tedious to enumerate.—**SISTERS OF THE CHRISTIAN SCHOOLS**. Several congregations of women for the education of poor female children also exist in the Roman Catholic church. A long catalogue of these, with the history of their origin, and their specific constitution, will be found in Wetser's *Kirchen-Lexicon*, vol. ix., pp. 782-784.

SCHOOLS OF LIBRARY ECONOMY. In May 5, 1884, after a year's consideration of the proposal of their chief librarian, Mr. Melvil Dewey, that they should open a school to meet the growing call for trained librarians animated by the modern library spirit, the trustees of Columbia College unanimously resolved that there should be established in connection with the college, a school in which instruction might be given in the principles of library management, and in which learners might qualify themselves to discharge the duties of professional librarians; the school to be called the Columbia College School of Library Economy.

The reasons urged were, in fine, that in the past few years the work of a librarian has grown into a distinct profession, affording opportunities of usefulness in the educational field inferior to no other, and requiring superior abilities to discharge its duties well, yet absolutely nowhere was there any provision for instruction in either the art or science of the librarian's business. The librarian has ceased to be a mere jailer of the books, and has become an aggressive force in his community. A rapidly increasing number of competent men and women are taking up librarianship as a life work. Public opinion and individual motives and actions are now influenced not so much by what is uttered from the rostrum or the pulpit, as by what is read; this reading can be shaped and influenced chiefly and cheaply only through the library, therefore the librarian who is master of his profession is a most potent factor for good. In our colleges every professor and every student in whatever department, necessarily bases most of his work on books, and is therefore largely dependent on the library.

This technical training can be given only through a well equipped professional school; for, librarians taken from the staff of a large library lack symmetrical training, since each employé must devote himself to the one part of the work that falls to his share, so that he can know little of the rest, except what he may learn by accidental and partial absorption of methods. A limited number gain certain experience in parts of library work, but few are systematically trained in any one thing, and fewer still have such training in all. The few really great librarians have been mainly self-made, and have obtained their eminence by literally feeling their way through long years of darkness.

Such a school was called for, not only by the inexperienced, who wished to enter library work, but also by a growing number of those already engaged in it. If, as so often stated, 10,000 volumes catalogued and administered in the best way are more practically useful than 30,000 treated in an unintelligent or inefficient manner, then it is of the greatest importance to advance by every possible means the general standard of library work throughout the country.

The Library School thus authorized opened January 5, 1887, with 20 students. The experiment proved that there was a greater demand than its projector had claimed both for more extended and more thorough work. The three months' course planned for the first year was lengthened to four on petition of the class, and for the second year both junior and senior courses were offered, so that practically from the outset the course has covered two years.

In Dec. 12, 1888, the founder and director of the school was elected Secretary of the University of the State of New York, and director of the State Library. The school which had been under his exclusive charge was continued at Columbia College till April, 1889, when, by agreement between the Columbia trustees and the Regents of the University, it was transferred to the State Library at Albany, together with its faculty, books, pamphlets, the illustrative collections of the American Library Association, and all the special matter accumulated for its use, Columbia College no longer offering training for librarianship. The success of the school in its new surroundings proves the wisdom of its removal to Albany.

The roomy and beautiful quarters in the new capitol afford unexcelled facilities, while the connection of the state library with the general library interests of the state, offers opportunities for comparative study impossible in any library without such relations. While students have practice throughout the course in actual library service, the last term is each year specially devoted to work under vigilant supervision and criticism in the various departments of the state library. In addition to state library practice, three local libraries are carried on under direction of the faculty by the students of the school, who thus have varied experience under supervision. Each class spends three weeks among the best managed libraries of Boston and vicinity, and of New York and vicinity in comparative study of methods and equipment, and faculty students largely attend the annual meetings of the American Library Association, where they share in the "library week" of the leading librarians of the country.

Any graduate of a college in good standing is admitted without examination as to general scholarship, but is examined in Latin, German, French, or any other required subject in which he may be deficient. While the school is designed for college graduates, any person not less than 20 years of age, of recognized fitness and character, who holds a regents' diploma, or who has graduated from an academy or high school registered by the regents as maintaining a satisfactory standard, may be admitted on passing a rigid entrance examination. The subjects studied are cataloguing, bibliography, classification, accession, and shelf work, loan systems, history of libraries, founding and government, library buildings, book-binding (from the library side), reading, and literary methods. For graduation, an original bibliography and a thesis are required. The Regents' library examinations are conducted by the University of the State, and pass-cards, certificates, and diplomas are awarded to the students.

In 1891, the regents established the degrees B.L.S. and M.L.S. on examination, and *honoris causa*, D.L.S., for bachelor, master, and doctor of library science. The B.L.S. will be conferred by the University of the State on those who attain the high standard prescribed for the complete course. The M.L.S. will be conferred only after advanced graduate work and successful library experience of at least five years. The D.L.S. is reserved for pre-eminent professional success.

The cordial indorsement and support of the American Library Association from the first may be traced in its proceedings from year to year since 1883, and 36 of its leading members have shown their warm interest by lecturing before the school on the subjects in which they were specially expert, thus supplementing the courses by the resident faculty.

In the first four years, the school had enrolled 101 students coming from 19 different states of the Union, beside England and Germany, and representing the leading colleges for both men and women. The demand for graduates of the school has thus far exceeded the supply. In 1890, 35 positions as librarians and assistants in 8 different states were filled by its students, in New York, 15; in Massachusetts, 8; in Illinois, 3; in Michigan, 3; in Connecticut, 2; in Pennsylvania, 2; in Maine, 1; in New Jersey, 1.

SCHOONER is a swift, sharply-built vessel, carrying usually two masts, though occasionally a greater number, and commonly is of small size. There are two classes of schooners—the "fore-and-aft schooner," or schooner proper, and the "topsail schooner." In the former, both foremast and mainmast are rigged like the mainmast of a cutter, with fore-and-aft sails. In the latter, the foremast carries a square topsail and a square topgallant sail. Off a wind, the former rig has a great advantage, as the schooner can sail up within $4\frac{1}{2}$ or even 4 points of the wind; but before the wind, the square topsail gives the advantage to the topsail schooner; and as the latter can on occasion strike her squaresails, and set a fore-and-aft topsail in their place, she has usually the preference. No sailing-vessel is faster than a schooner of fine build, when she carries ample canvas; hence it is a favorite form for the larger class of yachts; and before the introduction of steam dispatch-vessels, was employed much in the packet service. Schooners are still employed in the navy as revenue cruisers; and to a great extent in the merchant service for running small cargoes, and especially those of perishable goods, as fish or fresh fruit. They are easily managed by a small crew; but from the sharpness of their build, have no great amount of stowage.

SCHOPENHAUER, ARTHUR, a German philosopher, son of Johanna Schopenhauer, an authoress of considerable distinction (born 1770, died 1838), was born at Danzig, Feb. 23, 1788. He studied first at Göttingen, where the lectures of Schulze inspired him with a love of philosophy, and afterward at Berlin and Jena, in the last of which places he graduated in 1813. During the same year he published his first treatise, *Ueber die vierfache Wurzel des Satzes vom zureichenden Grunde* (Rudolst. 1813, 2d ed. Frankf. 1847), in which he lays down the logical basis of his future system. Schopenhauer spent the winter of 1813 at Weimar, where he enjoyed the society of Goethe, and the orientalist Friedr. Maier, who first turned his attention to the ancient Indian literature and philosophy, the study of which exercised a great influence on his future development. He then proceeded to Dresden, where he published a treatise on sight and color (*Ueber das Sehen und die Farben*, Liep. 1816), which was followed, three years later, by his great work, *Die Welt als Wille und Vorstellung* (The World considered as Will and Idea, Leip. 1819; 2d ed. 1844). After 1820 Schopenhauer lived partly in Italy and partly in Berlin, up till 1831, when he fixed himself in Frankfurt-on-the-Main, devoting himself uninterruptedly to the elaboration of his system. The fruits of his studies were *Ueber den Willen in der Natur* (Frankf. 1836); *Ueber die Freiheit des Willens*, *Ueber das Fundament der Moral*, the supplements to his principal work, which appear in the 2d edition of 1844; and *Parerga und Paralipomena* (Berl. 1851). He died Sept. 21, 1860. The fundamental doctrine of Schopenhauer is that the only essential reality in the universe is will; that what are called appearances exist only in our subjective representations, and are merely forms under which single original will shows itself. This will is not necessarily accompanied by self-consciousness, though it ever strives after its attainment, and hence Schopenhauer declared himself the uncompromising opponent of all the contemporary systems—those of Fichte, Schelling, and Hegel—in which the “absolute reason,” “consciousness,” etc., are posited as the necessary basis of thought. For his great rivals, Schopenhauer professed the most unmeasured scorn—calling Hegel, for example, a mere “scribbler of nonsense”—and in return was treated by them with such sovereign contempt that for years his name was almost unknown to the majority of German students. His theories of ethics and æsthetics also rest on peculiar and not very intelligible grounds. The best account of Schopenhauer's philosophy is to be found in Frauenstädt's *Briefe über die Schopenhauersche Philosophie* (Leip. 1854). See *Life*, by Helen Zimmern (1876).

SCHORL. See TOURMALINE.

SCHOTTISCHE (Ger. *Scottish*) a somewhat fanciful name given to a slow modern dance in $\frac{3}{4}$ time.

SCHOULER, JAMES, author and educator, was born in Arlington, Mass., Mar. 20, 1839. He graduated from Harvard University in 1859, and was admitted to the bar in 1862. He served in the Union army in 1862-'63, and after the war practised law in Boston and Washington. He is also law-lecturer in Boston University Law School, and the National Law School at Washington, and since 1889 has lectured on American History in Johns Hopkins University. He is the author of a *History of the United States*, 1783-1861 (five vols., 1880-'91); also, *Law of the Domestic Relations*; *Law of Personal Property*; *Law of Bailments*; *Law of Wills*; *Law of Executors and Administrators*.

SCHOULER, WILLIAM, 1814-72; b. Scotland; emigrated to the United States, and edited the *Lowell Courier*, 1841-47. He had charge of the Boston *Atlas*, the organ of the New England whigs, 1847-53; served in the legislature and in the constitutional convention of 1853; was connected with the *Cincinnati Gazette*, 1853-56, and with the *Ohio State Journal*, 1856-58, when he resumed his position on the Boston *Atlas*. He was adj. gen. of Massachusetts during the war of the secession. He published a *History of Massachusetts in the Civil War*.

SCHREINER, OLIVE, was b. in South Africa in 1862, the daughter of a Lutheran clergyman. When about twenty years of age she visited England, bringing with her the manuscript of her *Story of an African Farm*. This having been submitted to the novelist, Mr. George Meredith, and by him commended, it was published with a few alterations in 1884, under the pseudonym of “Ralph Iron,” and won instant success. It is best described as a spiritual autobiography representing the mental reaction by which an imaginative sensitive temperament passes from extreme Calvinism to hopeless atheism. Miss Schreiner has published also *Dreams and Dream Life and Real Life* (1893); *Stray Thoughts about South Africa* (1896).

SCHREVELIUS, CORNELIUS, a Dutch scholar, whose name was once better known than it is now, was born at Haarlem in 1615, and educated mainly by his father. In 1642 he succeeded his father as rector of the university of Leyden, and died Sept. 11, 1664. Schrevelius was a laborious and erudite man, but possessed little critical discernment. His most notable performance was a *Lexicon Manuale, Græco-Latinum et Latino-Græcum* (Leyden, 1654, 1657, 1664), of which there have been innumerable editions. It was long extensively used as a text-book in English schools, and, in the absence of anything better, deserved perhaps the respect which it obtained; but otherwise it cannot be pronounced a good dictionary. It is not at all exhaustive of the words in the Greek language; it does not sufficiently explain their different meanings, and its etymologies

are often erroneous and inept. Schrevelius also executed many *variorum* editions of the classics, Juvenal (1648), Hesiod (1650), Terence (1651), Virgil (1652), Horace (1653), Homer (1656), Martial (1656), Lucan (1658), Quintus Curtius (1658), Justin (1659), Cicero (1661), Ovid (1662), and Claudian (1665). These editions are remarkable for their correctness, and for the excellence of the paper and typography, but the notes are deficient both in taste and acumen.

SCHREYER, ADOLPH, b. Germany, 1828; studied painting in Munich, Stuttgart, and Düsseldorf. In 1854 he went with the Austrian army through the provinces along the Danube. His travels extended through Hungary, s. Russia, and Turkey; and he afterward visited the east and Algeria. He then took up his residence in Paris. He has made a special study of horses, and his landscapes are distinguished by strength and mastery of color. The best known of his pictures are perhaps, "The Dying Horse;" "The Wallachian Extra Post;" and "Horses Frightened by Wolves."

SCHRIVER, EDMUND, b. Penn., 1812; graduate of West Point, 1833; entered the army in the 2d artillery, was transferred to adj. gen. department with the rank of capt., 1838; resigned 1846. He was president of the Rensselaer and Saratoga railroad company, 1851-61. In April, 1861, he was aid-de-camp to Gov. Morgan; and in the war of the rebellion was commissioned lieut. col. 11th infantry, 1861; inspector of the army of the Potomac, 1862-65; rising through successive grades to brig. gen. in the regular army 1864. He was raised to maj. gen., 1865, for gallant service in the Shenandoah valley. He was in the northern Virginia and the Richmond campaign from the Rapidan to the surrender of the confederate stronghold. He retired from active service, 1881.

SCHRÖCKH, JOHANN MATTHIAS, 1733-1808; b. Vienna; a German church historian. He held for many years a professorship at the university of Wittenberg, where he lectured successively on philosophy, poetry, and history. He is best known by his *Christliche Kirchengeschichte* (35 vols. 1768-1803), and *Kirchengeschichte seit der Reformation* (10 vols. 1804-12) the two last volumes of which were added by Tzschirner.

SCHRÖDER, ANTOINETTE SOPHIE, 1781-1868; b. Germany; a noted actress. She appeared on the stage when only 12 years old at St. Petersburg, where her parents were acting. In 1795 she married Stollmers, the director of another company but was separated from him soon afterward. Her second husband was the singer Friedrich Schröder, who died in 1818; and she then married the actor Kunst. She acted in all the principal theaters in Germany, and acquired a great reputation by her impersonations of Phædra, Medea, Lady Macbeth, and other tragic characters. She retired from the stage in 1840. See *Sophie Schröder*, by P. Schmidt (1870).

SCHRÖDER, FRIEDRICH LUDWIG, 1744-1816, b. Germany. He began acting in the company of his parents when a mere child, and made a great reputation as a tragedian before he was thirty years of age. He became manager of the theater at Hamburg in 1771, and introduced to the German public several of Shakespeare's plays which he had translated. He was the author of many plays, and his *Dramatische Werke* were edited by Bülow with an introduction by Tieck.

SCHRÖDER-DEVRIENT, WILHELMINE, 1804-60, b. Germany; daughter of Friedrich Ludwig. She was a ballet dancer till she was fifteen years old, when she made her début at Vienna in Racine's *Phédre*. In the following year, after cultivating her powerful voice, she appeared as prima donna with great success in such operas as *Fidelio*, *Euryanthe*, *Norma*, the *Huguenots*. She was separated in 1828 from her first husband, Karl August Devrient, and after separating from her second husband, Döring, married a Livonian nobleman, Von Bock.

SCHRÖDTER, ADOLPH, b. Prussia, 1805; studied art at Berlin and Düsseldorf. In 1859 he became professor of drawing at the Carlsruhe polytechnic school. His humorous pictures are well known, and engravings of them are common in this country. The best are the "Wine Tasters," "Auerbach's Cellar," and "The Two Monks." He d. 1875.

SCHROON LAKE. See ADIRONDACKS.

SCHUBERT, FRANZ, composer, b. in Vienna, Jan. 31, 1797; d. there Nov. 19, 1828. He came from humble circumstances. His grandfather was a Moravian peasant, his father a school-teacher in Lichtenthal and the Rossau district, and his mother, Elizabeth Vitz, a cook in Vienna. His father taught him to play the violin, and his brother Ignaz, the pianoforte, but he was soon put under the choir-master to study music. He sang in the Lichtenthal choir, played violin solos in church, studied in the preparatory school for singers in the Hofkapelle, and played in the orchestra which the scholars there formed. In 1813 he composed his first symphony, and to avoid military conscription, he taught in his father's school in the Lichtenthal, during which time he composed his first mass (1814), which so delighted Salieri that he gave him lessons. In 1815 he began his remarkable activity as a composer. In that year alone he wrote 195 compositions, including operas, symphonies, songs, etc.; in 1816, 132 compositions, and in 1817, 69 compositions. He lived poorly, for he made no money either by his teaching or publications, and he was not fitted for society. In 1818 he was chosen as music-teacher to the family of Count Eszterházy, remaining a year. Although Schubert at the age of twenty-five had written 626 works, he was unknown to the Viennese public.

but one of his friends pushed the *Erkönig* and 18 other songs into publication, after which he always found a publisher. In 1822 he called to present Beethoven with a set of variations which he had dedicated to him. Beethoven was in a good humor but so deaf that conversation had to be carried on with pencil and paper, upon which Schubert became so embarrassed that he rushed from the house. Shortly before Beethoven's death he called again, as Beethoven had expressed great admiration for his songs, and was cordially received. In 1823-'4 Schubert had many disappointments regarding his operas, which were rejected, and he returned to the *Eszterázys*. He also applied for various posts, and failed. In 1828 he gave his first public concert, but his health, which had been impaired for years grew worse, and after an attack of typhus, he died. Schubert was buried in the Ortsfriedhof in Währing, near Beethoven. Schubert had no real musical training, and he never studied counterpoint. His mastery of form is doubly wonderful inasmuch as he was his own instructor. His first opus—the *Erkönig*—stands as one of the greatest of all songs, and had Schubert lived to maturity of genius his point is incalculable. He made an epoch in the German Lied, for he was the first great song-writer, and has had but two worthy successors to follow him—Schumann and Robert Franz. His works include: *Alfonso und Estrella*, Weimar, 1854; *Die Häusliche Krieg*, Vienna, 1861. *Rosamunde*, 1823; *Pierabras*, 1861, and other operas; church music; cantatas; ten symphonies; five minuets for strings and horns; six *Deutsche Tänze* for the same; Rondo for violin with orchestra in A; Concerto for the same in D; octet for strings and wind; twenty string quartettes; two pianoforte trios; twenty-one sonatas for the pianoforte; variations, dances, marches, impromptus, scherzos, rondos, fantasies, etc., for the pianoforte.

SCHUBERT, GOTTHILF HEINRICH VON, 1780-1860; b. Germany. After studying theology at Leipsic and medicine at Jena, he practiced as a doctor at Altenburg, Freiberg, and Dresden. He acted as director of an educational institution at Nuremberg 1809-16, and then was tutor to the children of the grand duke of Mecklenburg-Schwerin till 1819. He held a professorship of the natural sciences at Erlangen till 1827, and afterward at Munich.

SCHULTE, JOHANN FRIEDRICH; b. Winterberg, Westphalia, 1827; studied law, and practiced in Berlin and Bonn; was appointed professor of canon law at Prague in 1855 and at Bonn in 1872. His publications are: *System des Katholischen Kirchenrechts*; *Die Lehre von den Quellen des Katholischen Kirchenrechts*; *Die Rechtsfrage des Einflusses der Regierung bei den Bischofswahlen*. He opposed the dogma of papal infallibility.

SCHULTZE-DELITZSCH, HERMANN, 1808-83; b. Delitzsch, Germany; d. Potsdam. He studied law and served as asst. judge in Berlin, returning as surrogate to Delitzsch, 1841. He became interested in labor matters and was elected to the national assembly at Berlin, where he was made chairman of a committee to investigate the causes of distress among the laboring classes. He advocated the co-operative principle, and soon devoted himself to establishing co-operative associations which should secure to the mechanic the benefits of the wholesale market. Co-operative banks were established which advanced money on moderate terms, and co-operative stores. He wrote numerous pamphlets advocating the theory of the harmony of interests between capital and labor. He had a spirited controversy with Lassalle, who advocated state-help instead of Schultze's system of self-help. He was the atty. for the unions, and was elected from Berlin, 1861, to the Prussian house of deputies, and represented Wiesbaden in the Reichstag.

SCHUMACHER, HEINRICH CHRISTIAN, 1780-1850; b. Denmark; educated at Copenhagen and Göttingen. In 1813 he was appointed director of the Mannheim observatory, and in 1815 professor of astronomy and director of the Copenhagen observatory. In 1821 he was director of the Holstein and Lauenberg survey; in 1824 co-operated with the English board of admiralty in determining the difference of longitude between Greenwich and Altona, and in 1822 published tables of the distances of Jupiter, Saturn, Mars, and Venus from the moon. In 1822 he began the publication of his *Astronomische Nachrichten*, which survives him.

SCHUMANN, MME. CLARA (née WIECK), pianiste, was born at Leipzig, Sept. 13, 1819. She began to play in public when ten years old, and at the age of twelve appeared at a *Gewandhaus* concert at Leipzig; from that time she traveled all over Europe, creating a great sensation in Vienna, Berlin, and Paris. In 1840 she married Robert Schumann, the composer, under whose influence she studied Chopin, and composers of recent schools. After Schumann's death in 1856, she lived at Wiesbaden and Frankfurt-on-the-Main. Beside teaching in the Frankfort Conservatoire she frequently played in the principal cities of Europe. She died in 1896.

SCHUMANN, ROBERT ALEXANDER; a German composer; b. at Zwickau, Saxony, 1810. His gift for music showed itself early. After studying law for two years at the univ. of Heidelberg, he devoted himself to the composition of pianoforte music, in which he originated a completely new style, reflecting his own dreamy imaginative nature, often exhibiting genuine humor, and always thoroughly solid. At the time of his marriage to Clara Wieck, one of the greatest living pianists, he produced a series of songs, remarkable for their profound suggestiveness, which have taken a lasting hold on the minds of his countrymen. His piano concerto, and five symphonies, productions of

later life, are generally considered the finest of their class since Beethoven's. He has also produced some choral works of the highest class, notably the cantata *Paradise and the Peri*, and settings of parts of Goethe's *Faust* and Byron's *Manfred*. Among his chamber music, his piano quintet claims the highest rank. S. was editor of the famous *Neue Zeitschrift für Musik*, originated principally by himself, 1834-44; and his critical contributions have a foremost place in the literature of art. He d. at Endenich near Bonn, 1856. His name is the watchword of the Romantic school of music, in opposition to the Ideal, represented by Mendelssohn.

SCHURMAN, JACOB GOULD. An American educator born at Freetown, Prince Edward Island, May 22, 1854. He was educated abroad, as Gilchrist Scholar for Canada at the University of London (1875-1878), and as Hibbert Traveling Fellow for Great Britain at Heidelberg, Berlin, and Göttingen; was Professor of Political Economy, Psychology, and English Literature in Arcadia College, N. S. (1880-1882); Professor of Philosophy and English Literature in Dalhousie College (1882-1886); elected Professor of Philosophy in Cornell University in 1886, Dean of the Sage School of Philosophy in 1891, and President of Cornell in 1892. Pres. Schurman became editor of the *Philosophical Review* in 1892, and of the *School Review* in 1893. He is the author of *Kantian Ethics and the Ethics of Evolution* (1881), *The Ethical Import of Darwinism* (1888), *Belief in God* (1890), and *Agnosticism and Religion* (1896).

SCHURZ, CARL, b. Prussia, 1829; educated at Cologne and Bonn. He edited a liberal newspaper in association with Gottfried Kinkel, professor of rhetoric at Bonn, where he endeavored unsuccessfully to organize an insurrection in 1849; escaped with Kinkel; was adjutant in the revolutionary force, and on the capture of Rastadt, which he helped defend, fled to Switzerland. He returned to Germany in 1850 and contrived the escape of Kinkel, who had been sentenced to 20 years' imprisonment. After a residence in Paris as correspondent for German papers, and in London, where he was a teacher, he settled in Philadelphia, 1852. Removing to Madison, Wis., in 1855, he made republican campaign speeches in German in 1856, and the next year was an unsuccessful candidate for lieutenant-governor. In 1859 he began to practice law in Milwaukee. He was a member of the republican convention in 1860, and delivered both English and German speeches during the canvass of that year. Late in 1861 he resigned the position of minister to Spain, to which President Lincoln had appointed him, and joined the army. He was made brig.-gen. in 1863; commanded a division at the second battle of Bull Run, was commissioned maj.-gen. 1863, led the 11th corps at Chancellorsville, was at Gettysburg and Chattanooga, and at the close of the war resumed the practice of law. He was Washington correspondent of the *N. Y. Tribune*, 1865-66; founded the *Detroit Post* in 1866, and the next year became editor of the *St. Louis Westliche Post*. He was temporary chairman of the republican convention at Chicago in 1868, and U. S. senator from Missouri, 1869-75. He opposed many of the measures of the Grant administration, and in 1872 was president of the Cincinnati convention which nominated Greeley for president. During the state canvass in Ohio in 1875, he made some powerful speeches against the inflation of the currency. He was secretary of the interior under the Hayes administration, 1877-81. From 1881-83 he was editor of the *New York Evening Post*. In the presidential campaign of 1884 he was one of the earliest among the Independent Republicans to repudiate the nomination of Mr. Blaine, and in N. Y., N. J., Conn., and several western states, he made vigorous speeches, both in German and in English, favoring the election of Mr. Cleveland. He published *Henry Clay* in the "American Statesmen" series (1887), and *Abraham Lincoln* (1896).

SCHÜTZ, HEINRICH (1585-1672), a German musician and composer, was born in Voigtland, studied at Venice, and returning to Germany became Kapellmeister at Dresden. He is known by his church-music, and especially for having been the first to introduce Italian opera into Germany. He is sometimes spoken of under the Latinized form of his name, *Sagittarius*.

SCHUYLER, a co. in w. Illinois, bounded on the s.e. by the Illinois river, and on the s.w. by Moin river. About 425 sq. m.; pop. '90, 16,013. Co. seat, Rushville.

SCHUYLER, a co. in n. Missouri, adjoining Iowa; bounded on the w. by the Charleston river; about 325 sq. m.; pop. '90, 11,249. Co. seat, Lancaster.

SCHUYLER, a co. in s.w. New York, on the Northern Central and the Fall Brook railroads; about 350 sq. m.; pop. '90, 16,711. Co. seat, Watkins.

SCHUYLER, EUGENE, b. Ithaca, N. Y., 1840; graduated with high honors at Yale, 1859; was admitted to the bar in New York; was appointed consul at Moscow by Pres. Johnson, and later became acting sec. of legation at St. Petersburg. He was appointed sec. of legation and consul-general at Constantinople, 1875, and soon afterward was sent on an inspection tour through Bulgaria to investigate the Turkish massacres committed there. He was appointed consul-gen. to Italy, 1879; and was consul-gen. to Roumania, Servia, and Greece, 1880-84. He published *Peter the Great, Emperor of Russia* (2 vols., 1884); *American Diplomacy and the Furtherance of Commerce* (1886), etc. He died July 18, 1890.

SCHUYLER, PETER, 1657-1724; acted as mediator between the five nations of the

Indian race and the white settlers of New York and the New England colonies. He was at the head of an expedition which destroyed the French settlements in 1691. In 1710 he went to England with a party of five Indian chiefs, whom he had invited to accompany him, for the purpose of awakening in the government an interest in the occupation of Canada, then held by the French. In 1719 he was governor of New York.

SCHUYLER, PHILIP, 1733-1804; b. Albany, N. Y.; entered the army during the French and Indian war, 1755, and was assigned by lord Howe to the commissary's department. After the war he was a member of the colonial assembly of New York, and resisted earnestly the British attempts to tax the colonies without their consent; was a delegate to the continental congress, 1775, by which he was made a maj.-gen. and assigned to the command of the troops in New York and of the expedition against Canada; but sickness having compelled him to relinquish this service, it devolved on Gen. Montgomery. On his recovery he actively superintended Indian affairs and army discipline. St. Clair's evacuation of Ticonderoga threw, for a time, unfounded suspicions on Gen. Schuyler, which led to his being superseded; but a court of inquiry afterward fully approved his conduct, and Washington solicited him to accept a new command. Though he declined this, he rendered efficient service in the military operations in New York. Before the national constitution was formed he was a member of congress; and afterward twice represented his state in the U. S. senate.

SCHUYLKILL, a river of Pennsylvania, which rises in the carboniferous highlands of the eastern centre of the state, and, flowing 125 m. s.e., empties into the river Delaware at the lower end of Philadelphia. The river is celebrated for its scenery.

SCHUYLKILL, a co. in e. central Pennsylvania, drained by the Schuylkill, Little Schuylkill, and Swatawa rivers, and Mahanoy and Cattawissa creeks; about 775 sq.m.; pop. '90, 154,163. Co. seat, Pottsville.

SCHWAB, GUSTAV, 1792-1850; b. Germany; educated at Tübingen; tutor in the theological seminary there till 1817. He was professor of ancient literature in the Stuttgart gymnasium, 1817-37, and a pastor there, 1837-45. He was afterward chief counselor of the Evangelical consistory. His ballads and romances are highly esteemed in Germany. His best-known prose work is, perhaps, *Die Schönsten Sagen des Classischen Alterthums* (1838-40). His chief poetical works are *Gedichte* (1828); and *Fünf Bücher deutscher Lieder und Gedichte* (1838).

SCHWALBACH, or LANGENSCHWALBACH, a German watering-place in Hesse-Nassau, n.w. of Wiesbaden; pop. abt. 3000. Many visitors annually come to drink the waters, which are also largely exported. They are the strongest known chalybeate springs.

SCHWALBER, known as CHELIDONIUS, a swallow, the Greek translation of Schwalber, d. 1521; a monk of the Scotch Benedictine abbey of St. Egidius. He wrote the Latin verses to Albert Dürer's *The Apocalypse. The Passion of Christ, and The Life of the Virgin Mary*, while in the monastery; and verses on subjects connected with the church and its devotees. He had the reputation of being a good Latin scholar, and for his love of learning was nicknamed *Musophilus*. He became abbot of the *Schotten Kloster* near Vienna, 1515.

SCHWANTHALER, LUDWIG MICHAEL, a celebrated German sculptor, was b. in 1802 at Munich, where his father, Franz Schwanthaler, practiced the same art. Young Schwanthaler entered his father's workshop at the age of 16; and on the death of the latter in 1821, he undertook to carry on his father's business. His first important commissions were received in 1824 from king Maximilian. After a brief residence in Rome, he set up a studio of his own at Munich, and shortly after executed for the *Glyptothek* there two fine bas-reliefs from Homer: "Achilles struggling in the Scamander," and the "Battle by the Ships," besides a statue of Shakespeare for the saloon of the theater, and the Bacchus-frieze for the banqueting-hall in the palace of duke Maximilian. In 1832 he revisited Rome, for the purpose of preparing models for that portion of the national monument of Valhalla intrusted to his supervision. He remained two years. On his return to Munich, he began his bas-reliefs to illustrate Pindar's *Epinikia* (Triumphal Odes) and the myth of Aphrodite, the latter of which is a frieze. In 1835 he was appointed professor at the Munich academy. Henceforth, the interest of his career is mainly professional; but the number of his works is singularly great, while their excellence is such as to place him in the first rank of German sculptors. His distinguishing characteristics are a thorough originality of design, and boldness of imagination; while the extraordinary extent of his acquaintance with the sculpture of Greece and of the middle ages gave a great richness and variety to his execution of details. Among his works may be mentioned 24 statuettes in the *Pinakothek* at Munich; the great bas-relief frieze (in the Barbarossa hall), more than 200 ft. long; the models for the 12 statues of the ancestors of the house of Wittelsbach, the 15 colossal statues for the front pediment of the Valhalla, the models of the 15 statues of the "Battle of Arminius" for the northern end of the same structure, and the model of the colossal statue of Bavaria, 54 ft. high; a marble statue of the emperor Rudolf for the cathedral of Spire, models for the statues of Goethe and Jean Paul Richter, a statue of Mozart, marble groups of Ceres and Proserpina (at Berlin), etc., besides numerous other works executed by his pupils from his designs. He died in 1848.

SCHWARTZ. See **SCHWARZ.**

SCHWARZ, BERTHOLD, b. Germany, early in the 14th century; a Franciscan monk, whose name is thought to have been Konstantin Ancklitzen. He was an alchemist, who lived at Nuremberg or Mentz, and was called Schwarz (i.e., "Black") from his supposed practice of the black art. He is said to have discovered gunpowder when in prison for sorcery. It is supposed that gunpowder was discovered as early as 1330, or at least before any date assigned to Schwarz's discovery, which probably consisted in utilizing it for military purposes. There is a monument to him at Freiberg, his birthplace.

SCHWARZ, CHRISTIAN FRIEDRICH, a distinguished German missionary, was b. at Sonnenburg, in Brandenburg, Oct. 26, 1726. He studied at Halle, and having resolved to become a missionary in the East Indies, obtained ordination at Copenhagen, with the view of joining the Danish mission at Tranquebar, where he arrived in 1750. His career is a beautiful example of what may be accomplished when piety, integrity, good sense, and a charity that knows how to prevent the virtue of zeal from lapsing into the vice of fanaticism, unite harmoniously in a man. After laboring 15 years at Tranquebar, he went to Trichinopoly, where he founded a church and school, and also acted as chaplain to the garrison. Here the fruits of his long and consistent career of pious activity gradually began to show themselves in considerable conversions from Hinduism. In 1777, another missionary was sent to his assistance; and by the permission of the rajah of Tanjore, whose friendship he had acquired, he built a church in that city. So highly did the native rulers admire his integrity, that once, when Hyder Ali, of Mysore, was arranging terms of peace with the Madras government, he demanded that Schwarz should act as their agent—"him, and no other one," said the sultan, "will I receive and trust." On this occasion, Schwarz resided three months at Seringapatam. During the terrible Carnatic war which soon after followed (1781-83), and for which Schwarz thought the British were to blame, a striking testimony was given of that universal respect entertained for his character. The inhabitants and garrison of Tanjore were dying of starvation, and neither the British nor the rajah could induce the cultivators to sell them provisions. In despair, Schwarz was appealed to, and when he gave his word that payment should be made, the farmers believed him, and sent the requisite supplies. On the death of the rajah of Tanjore in 1787, Schwarz was appointed tutor and guardian of his young son, Maha Sarboji, who turned out, under Schwarz's care, one of the most accomplished sovereigns in or out of India. Schwarz died Feb. 13, 1798.

SCHWARZBURG, HOUSE OF, one of the oldest German families, founded about the middle of the 12th c., by Sizzo, count of Schwarzburg and Käsenburg. The two sons of Sizzo were Heinrich, who succeeded his father as count of Schwarzburg, and Günther, who became count of Käsenburg. The former, dying childless in 1184, his possessions went to his brother, who left two sons, Günther, who continued the family of the counts of Käsenburg, and Heinrich, from whom sprung the counts of Schwarzburg. In 1349, Günther XXI., the younger son of Heinrich XII., was elected emperor of Germany, but he died within the year of his election. Count Günther XL. of Schwarzburg and Arnstadt, who introduced (1541) the reformation into his states, was the common ancestor of the two existing lines of the Schwarzburg family; his son, Johann Günther, founding the line of Schwarzburg-Sondershausen (q. v.), and Albert, that of Schwarzburg-Rudolstadt (q. v.).

SCHWARZBURG-RUDOLSTADT, a German principality, bounded on the e. by Weimar, Altenburg, and Meiningen, with a detached part, 30 m. to the n., in Prussian Saxony. Area, 363 sq. m.; pop. '95, 88,685, of whom about 88,000 were Protestants. It consists of the Upper Lordship (*Rudolstadt*, 282 sq. m.) and the Lower Lordship (*Frankenhausen*, 81 sq. m.). The Schwarz, Ilm, and Saale water the surface, which is for the most part covered with spurs of the Thüringerwald. The ordinary crops are raised, and there are a few manufactures. The principality contains many spots distinguished for beautiful scenery; and besides the vale of the Schwarz, the convent ruins of Paulinzelle, and the remains of the castle of Kyffhausen, attract many visitors. Schwarzburg-Rudolstadt has a diet of 16 members, of whom 12 are chosen by general election. Schwarzburg-Rudolstadt has one vote in the federal council, and one in the diet.

SCHWARZBURG-SONDERSHAUSEN, a German principality, is partly surrounded by Prussian Saxony. Area, 333 sq. m.; pop. '95, 78,074, mostly Protestants. It consists of a Lower Lordship (*Sondershausen*) and an Upper Lordship (*Arnstadt*). The former of these, watered by the Helbe and Wipper, is fertile and agricultural; while the latter is mountainous, and is the seat of active manufactures. The diet contains 5 members nominated by the prince, 5 chosen by the most heavily taxed, and 5 by general election. Schwarzburg-Sondershausen has one voice in the federal council, and sends one representative to the imperial diet.

SCHWARZENBERG, a princely family of Germany, dates from 1420, when *Erkinger von Seinsheim* purchased the lordship of Schwarzenberg in Franconia, and was raised (1429) by the emperor Sigismund to the dignity of baron of the empire. Two of this family have acquired a European reputation; the first, ADAM, count of Schwarzenberg, who was born in 1587, and became prime-minister and adviser of Georg-Wilhelm, elector

of Brandenburg. He was all powerful during the Thirty Years' war, and brought down terrible calamities on Brandenburg by his obstinate adherence to the alliance with Austria against the Protestant league for which he was punished after the accession of the "great elector," in 1640, by being despoiled of his power, and imprisoned in the fortress of Spandau, where he died Mar. 17, 1641. The other, KARL PHILIPP, prince of Schwarzenberg, was born at Vienna, April 15, 1771, first served against the Turks, and had risen to the grade of lieutenant-field-marshal in 1799, at which date he raised a regiment of Hulsars at his own cost. He was under the orders of Mack in the campaign of 1805, and commanded a division at Ulm; but when he saw that the battle was lost, he cut his way through the French army, and retired with his regiments to Eger, afterward taking part in the great battle of Austerlitz. He was ambassador at the Russian court in 1808, by the express wish of the emperor Alexander; fought at Wagram in 1809; and after the treaty of Vienna, conducted the negotiations preliminary to the matrimonial connection of Napoleon with the Hapsburg family; and both in this capacity and as ambassador at Paris, so gained the esteem of Napoleon, that the latter expressly demanded for him the post of general-in-chief of the Austrian contingent of 30,000 men which had been sent to aid France against Russia in 1812. Schwarzenberg with his little army entered Russia from Galicia, passed the Bug, and achieved some slight successes, but was afterward driven into the "duchy of Warsaw" (see POLAND), and took up a position at Pultusk, where he concluded with the Russians an armistice which secured the French retreat. Schwarzenberg was much blamed for his dilatory conduct at the time; and his tardiness, ascribed by the French historians to secret instructions from his own government, has since been much animadverted upon by them; but nevertheless Napoleon concealed any dissatisfaction he might have felt, and demanded (1813) for him from the Austrian government the baton of field-marshal. After a brief sojourn at Paris, Schwarzenberg was appointed to the command of the Austrian army of observation in Bohemia; and when Austria joined the allied powers, he became generalissimo of the armies of the coalition; gained the victory of Leipsic (q.v.), and introduced a cautious system of tactics, which insured a progressive hemming-in of the French, and in spite of their occasional successes, completely wore them out. On the return of Napoleon from Elba, he obtained the command of the allied army on the upper Rhine, and a second time entered France. On his return to Vienna, he was made president of the imperial council for war, received an extensive grant of lands in Hungary, and was allowed to engrave the imperial arms of Austria on his escutcheon. He died of apoplexy at Leipsic, Oct. 15, 1820.—His nephew, FELIX LUDWIG JOHANN FRIEDRICH, born Oct. 2, 1800, distinguished himself in the Italian campaign of 1848, was placed at the head of affairs in Vienna, called in the aid of the Russians against Hungary, and pursued a bold policy in Germany. He died at Vienna, April 5, 1852.

SCHWARZWALD. See BLACK FOREST.

SCHWATKA, FREDERICK, American explorer, was born at Galena, Illinois, Sept. 29, 1849. He graduated from West Point in 1871, studied law, and was admitted to the bar in 1875, then took up the study of medicine and received his degree in New York in 1876. He was in command of the Franklin search expedition, which sailed for the Arctic regions in June, 1878. The expedition succeeded in finding the skeletons of many of Sir John Franklin's lost party, returning after many trying experiences, in 1880. Schwatka later explored the course of the Yukon River, in Alaska, in 1883 (*Report*, 1885). He published full accounts of his explorations. Died Nov. 2, 1892.

SCHWEDT, a handsome t. of Prussia, in the province of Brandenburg, on the Oder, 51 m. n.e. of Berlin. Weaving, brewing, the manufacture of soap and of tobacco, which is here extensively grown and sold, are the principal branches of industry. Pop. '95, 10,114.

SCHWEGLER, ALBERT, 1819-57; b. Würtemberg; studied theology at the university of Tübingen; appointed professor there of classical philology, 1848; afterwards of ancient history. In theology and criticism he was of the "Tübingen school." He published annotated editions and translations of the Clementine Homilies, 1847; Aristotle's Metaphysics, 1847-48; Eusebius, 1852; a *History of Philosophy*, often reprinted and translated into many languages—into English by Prof. J. H. Seelye of Amherst college; his *History of Grecian Philosophy* was published after his death, 1859.

SCHWEIDNITZ, a t. of Prussia, in the province of Silesia, on the left bank of the Weistritz, 31 m. s.w. of Breslau. Woolen goods, leather, and agricultural implements are manufactured; and the fairs for corn, cattle, and yarn are much frequented. It was several times besieged in the Thirty Years' war and the Seven Years' war. Pop. '95, 26,130.

SCHWEINFURT, an ancient and long an imperial free city, the *Tarjectus Suevorum* of the Romans, now a town of Bavaria, in Lower Franconia, on the Main, 29 m. n.e. of Würzburg by railway. It contains a beautiful market-place, in which important cattle and wool markets are held. Wine-culture, sugar-refining, and manufactures of chemicals and dyeing materials, as white-lead, ultramarine, Schweinfurt green, etc., are carried on. See GREEN. Pop. '95, 13,515.

SCHWEINFURTH, GEORG AUGUST, a distinguished African traveler, was b. in Riga, Sept. 29, 1836. He studied at Heidelberg, Munich, and Berlin, making botany his

specialty. In 1864 he made a journey through the valley of the Nile, and along the coasts of the Red sea; and on his return to Berlin in 1866 had the botanical, zoological, and geological fruits of his travels classified. In 1868, by the aid of a grant from the royal academy of sciences of Berlin, he again started for Africa and made his way from Khartoum into the interior in the company of the ivory-traders, along the valley of the White Nile. Between the 4th and 6th parallels of n. lat. he penetrated as far westward as the 26th meridian, carefully noting the nature of the countries through which he passed, and the character of their various tribes. He returned in 1872; and in 1874 published the results of his travels under the title of *Im Herzen von Afrika*, 2 vols. An English translation, *The Heart of Africa*, was published the same year. Schweinfurth was made president of the Egyptian geographical society in 1875. In 1891-2, accompanied by Schöller, he visited the Italian colony or Erythræa. With Ratzel he published in 1888 *Emin Pascha; Reisebriefe und Berichte*.

SCHWEINITZ, EDMUND ALEXANDER VON, 1825-87; b. Bethlehem, Penn.; studied theology in the Moravian seminary there, and at the university of Berlin; became a clergyman, and was chosen one of the bishops of the Moravian church; editor of the *Moravian* for several years; one of the translators of *Herzog's Real Encyclopedia*; and author of *The Moravian Manual; Systematic Beneficence; The Moravian Episcopate*; and *the Life of Leisberger, the Western Pioneer and Apostle to the Indians*, 2 vols.

SCHWEINITZ, LEWIS DAVID VON, PH.D., 1780-1834; b. Bethlehem, Penn.; educated in Germany, and resided there, 1798-1812; went as a Moravian minister to Salem, N. C.; resided at Bethlehem, 1821-34. He was specially devoted to botany, and by original researches added 1400 new species to the catalogues of American flora; was author of several botanical monographs, among which are those on the genera *viola* and *carex*, catalogues of the fungi of North Carolina and of North America, and of plants collected by Thomas Say in the n.w. territory.

SCHWENKFIELD, KASPAR VON, 1490-1561; b. Silesia; became an enthusiastic advocate of the reformation, but his views concerning the deification of the body of Christ, the Lord's supper, and the admission of only holy persons to the church, brought on him the opposition of the reformers. Having been expelled from Silesia he was driven from town to town. His moral character was never assailed by his opponents, and his writings are valuable contributions to the history of the reformation. A sect named after him arose in Silesia, but the most of them removed in 1734 to eastern Pennsylvania, where they had in 1896 about 1300 members, with 4 churches.

SCHWERIN, capital of the grand duchy of Mecklenburg-Schwerin, is agreeably situated on the w. shore of the Schweriner see, a lake 14 m. in length and 3 m. broad, and abounding in fish. Schwerin is divided into the old town, the new town, and the suburb, is well built, and contains one of the finest Gothic cathedrals in northern Germany, begun in 1248 and finished in the 15th century. The ducal castle, erected by Wallenstein, stands on a small island. In Schwerin there are tobacco-factories, an iron-foundry, breweries, etc. Pop. '95, 33,643.

SCHWYZ, one of the mountain cantons in the middle of Switzerland, is bounded on the n. by the canton of St. Gall and the canton and lake of Zürich, and on the s. by the canton of Uri and the lake of Lucerne. Area, 351 sq. m.; pop. (Dec. 1894), 50,581. The whole surface is covered with mountains, except small tracts in the s.w. and n.e.; but there are no glaciers nor any everlasting snow except on the Rieselstock, 8890 ft. high, on the e. frontier. The canton comprises a third part of lake Zug, the most northern angle of the lake of the Four Cantons, the whole of the mountain-mass of the Righi (q.v.), the plain in which lies the small lake Lowerz, and the valleys of the Muotta, Sihl, and Aa, the principal rivers. Cattle-breeding is the employment of almost the whole of the inhabitants. Fruits and wine are cultivated to some extent; and cattle, cheese, and timber are exported. Manufactures are confined to home needs.

SCIAC'CA (anc. *Thermæ Seluntinæ*), a seaport of Sicily, in the province of Girgenti and 37 m. n.w. of the city of the same name. Pop. '81, 20,709.

SCIÆNIDÆ, a family of acanthopterous fishes, somewhat resembling perches; having a compressed body; a simple or double dorsal fin, the first part spiny; the gill-covers variously armed; the head generally inflated, and its bones cavernous; the scales are ctenoid, and in general obliquely ranged. The sciænidæ are divided into many genera, and widely distributed. Most of them are marine, but a few inhabit fresh water.

SCIAGRAPHY, the drawing of sections (q.v.) of buildings, so as to show the interior of them.

SCIATICA is the term given to neuralgia of the great sciatic nerve. See NERVOUS SYSTEM. It has been shown by Graves to be a frequent complication of gout; but rheumatism, or exposure to cold and wet, is its most common cause. It is characterized by irregular pains about the hip, especially between the great trochanter of the thigh-bone and the bony process on which the body rests when sitting, spreading into neighboring parts, and running down the back of the thigh to the leg and foot; or the pains may occupy only isolated parts, as the knee-joint, the calf of the leg, or the sole of the foot. Sciatica is a very obstinate disease, but the treatment is the same as that of neuralgia generally, except when it is merely a complication of gout, in which case the primary disease must be attacked as well.

SCIENCE, CHRISTIAN, professes—I. To impart religious knowledge: II. To heal disease. It is sometimes called *Mind-Cure*. An outline of its claims on both points may be given chiefly in the words of those who uphold it. I. They call it "The understanding of God." They say, "To admit aught but the good intelligence lays the foundation of evil, and goes to support two powers, viz., God and the devil, truth and error; and to conclude that error is an intelligence, *when it is the absence of it*. . . . *A lie is all the Satan there is:*" "There is neither a personal deity, a personal devil, nor a personal man:" "The mineral becomes a plant, the plant an animal, the animal a man, and man becomes divine:" "Owing to the unexampled spiritual evolution of the man Jesus his individual life became merged and blended into unity with the only begotten of the Father, the universal Christ," "the all-pervading divine presence a humanized principle of life and light." II. The theory on which they rest the healing of disease. "Science decides matter, or the mortal body to be nothing but a belief and an illusion." "Jesus was the most scientific man that ever trod the globe." In the garden of Gethsemane he was touched with "the utter error of a belief of life in matter." On the cross he gave the world "an example and proof of divine science." His Christianity "destroyed sin, sickness, and death, because it was metaphysics and denied personal sense, bore the cross, and reached the right hand of a perfect principle." "*Mind acts on mind to dispel the illusion of sickness.*" While one writer says that "an idea directed upon the seat of a supposed ailment causes a stream of nervous energy to flow towards the secreting organ", another says, "This nervous energy I prefer to call the universal, divine life-principle in nature, an all-pervading, omnipresent, vivific principle of life and motion identical in its higher aspects with the Holy Spirit of the gospels." The opponents of this system show *first* that so far as it has practical value, it has no novelty, inasmuch as the power of the mind to resist and, in various unmeasured degrees, to overcome imaginary, and even real, disease has always been recognized in Christian systems, and used by physicians and others in charge of the sick: and *second* that the philosophic aspects of the system strongly resemble the theosophy of Indian Brahmins and, indeed, seem to have been derived from it; and that as a philosophy it is utterly devoid of a power for practical application.

SCIENCE, SOCIAL. See **SOCIAL SCIENCE**.

SCIENCES, the name for such portions of human knowledge as have been more or less generalized, systematized, and verified. Generality as opposed to mere particulars, system as opposed to random arrangement, and verification as opposed to looseness of assumption, concur in that superior kind of knowledge dignified by the title in question. Geography, chemistry, and political economy are now sciences. The first has been so for many ages, although greatly advanced in recent times; the two last, scarcely more than a century. Chemical facts and maxims of political economy had been known from a much earlier date, but they did not in either case amount to science; the generalities were few or bad, system and certainty were both wanting. In the different branches of natural history—mineralogy, botany, zoology—there had been a large store of accumulated facts before any one branch could be called a science. The *quality* of the knowledge is of more consequence than the quantity.

The term *philosophy* (q.v.) is to a certain extent, but not altogether, coincident with science, being applied to the early efforts and strainings after the explanation of the universe, that preceded exact science in any department. Both names denote the pursuit of knowledge as knowledge, or for intellectual satisfaction, in contrast to the search that is limited to immediate practice or utility.

The sciences have been variously classified, and the principles of their classification have been a subject of discussion. We shall here describe the mode of classifying them in accordance with present usage, and with the principles most generally agreed upon.

It is convenient to prepare the way by distinguishing between the theoretical sciences, which are the sciences properly so called, and practical sciences. A theoretical science embraces a distinct department of nature, and is so arranged as to give, in the most compact form, the entire body of ascertained (scientific) knowledge in that department: such are mathematics, chemistry, physiology, zoology. A practical science is the application of scientifically obtained facts and laws in one or more departments to some practical *end*, which end rules the selection and arrangement of the whole; as, for example, navigation, engineering, mining, medicine. Navigation selects from the theoretical sciences—mathematics, astronomy, optics, meteorology, etc.—whatever is available for guiding a ship on the seas, and converts the knowledge into rules or prescriptions for that purpose. The arts that can thus draw upon the exact sciences are by so much the more certain in their operation; they are the scientific arts.

Another distinction must be made before laying down the systematic order of the theoretical sciences. A certain number of these sciences have for their subject-matter each a separate department of natural forces or powers; thus, biology deals with the department of organized beings, psychology with mind. Others deal with the application of powers elsewhere recognized to some region of concrete facts or phenomena. Thus, geology does not discuss any natural powers not found in other sciences, but seeks to apply the laws of physics, chemistry, and biology to account for the appearances of the earth's crust. The sciences that embrace peculiar natural powers are

called abstract, general, or fundamental sciences; those that apply the powers treated of under these to regions of concrete phenomena are called concrete, derived, or applied sciences.

The abstract or theoretical sciences as most commonly recognized, are these six: mathematics, physics, chemistry, biology (vegetable and animal physiology), psychology (mind), sociology (society). The concrete sciences are the natural history group—meteorology, mineralogy, botany, zoology, geology, also geography, and we might, with some explanations, add astronomy. The abstract or fundamental sciences have a definite sequence, determining the proper order for the learner, and also the order of their arriving at perfection. We proceed from the simple to the complex, from the independent to the dependent. Thus, MATHEMATICS relates to *quantity*, the most pervading, simple, fundamental, and independent attribute of the universe. The consideration of this attribute has therefore a natural priority; its laws underlie all other laws. As mathematics is at present understood, it has an abstract department, which treats of quantity in its most general form, or as applied to nothing in particular—including arithmetic, algebra, and the calculus—and a concrete or applied department—viz., *geometry*, or quantity in space or extension. It has been suggested that general mechanics, or the estimation of quantity in *force*, should be considered a second concrete department. But usually mechanics ranks with the next fundamental science in order, called physics.

NATURAL PHILOSOPHY has long been considered the name of a distinct department of science: the designation PHYSICS is now more common. This science succeeds mathematics, and precedes chemistry. Of all the fundamental sciences, it has the least unity, being an aggregate of subjects with more or less connection. Mechanics, hydrostatics, hydraulics, pneumatics, acoustics, astronomy, are all closely related; they represent the phenomenon of movement in *mass*, as applied to all the three states of matter, solid, liquid, and gas. The remaining subjects—heat, light, and electricity—together with the attractions and repulsions that determine cohesion, crystallization, etc., are described as relating to movement in the *molecule*. We have thus molar physics and molecular physics; and the tendency is now to treat the two separately.

CHEMISTRY lies between physics and biology, reposing upon the one, and supporting the other. It assumes all the physical laws, both molar and molecular, as known, and proceeds to consider the special phenomenon of the composition and decomposition of bodies considered as taking place in definite proportions, and leading to change of properties. The composition of a cup of tea from water, sugar, milk, and infusion of tea-leaf is physical; the composition of marble from oxygen, carbon, and calcium is chemical. In the one case, the properties of the separate ingredients are still discernible; in the other, these are merged and untraceable.

BIOLOGY, or the science of living organization, involves mathematical, physical, and chemical laws, in company with certain others called vital. It is most usually expounded under the designations vegetable and animal physiology; and in the concrete departments, botany, zoology, and anthropology.

PSYCHOLOGY, or the science of MIND, makes a wide transition, the widest that can be taken within the whole circle of the sciences, from the so-called material world, to the world of feeling, volition, and intellect. The main source of our knowledge of mind is self-consciousness; and it is only from the intimate connection of mind with a living organism that the subject is a proper sequel to biology. Not until lately has any insight into mind been obtained through the consideration of the physical organ—the brain; so that psychology might have been placed anywhere, but for another consideration that helps to determine the order of the sciences, viz., that the *discipline*, or method, of the simpler sciences is a preparation for the more abstruse. Mathematics and physics especially are an admirable training of the intellect for the studies connected with mind proper, although the laws of physics may not of themselves throw any direct light on the successions of thought and feeling.

These five sciences embrace all the fundamental laws of the world, and, if perfect, their application would suffice to account for the whole course of nature. To a person fully versed in them, no phenomenon of the explained universe can appear strange; the concrete sciences and the practical sciences contain nothing fundamentally new. They constitute a liberal scientific education. It is not uncommon, however, to rank SOCIOLOGY, or the laws of man in society, as a sixth primary science following on psychology, of which it is a special development.

Dr. Neil Arnott, in his work on *Physics*, first published in 1828, gave as the primary departments of nature—physics, chemistry, life, and mind (under which he would include the laws of society). He did not discard mathematics, but looked upon it as a system of technical mensuration, created by the mind to facilitate the study of the other sciences, as well as the useful arts. The natural laws expressed by mathematics are few and simple, and the body of the science consists of a vast scheme of numerical computation, whose value appears in its applications to astronomy and the other physical sciences.

Auguste Comte, who, in his *Cours de Philosophie Positive*, went over the entire circle of the theoretical, abstract, or fundamental sciences, enumerated these as follows: mathematics, astronomy, physics, chemistry, biology, sociology. He thus detaches astronomy from physics, considering it as the abstract science that brings forward and works out

the law of gravitation. He has no distinct science of psychology, an omission that has been generally condemned. See POSITIVISM.

Mr. Herbert Spencer, in a tract on the *Classification of the Sciences*, takes exception to the scheme of Comte, and proposes a threefold division, according to the gradations of concreteness in the subject-matter. The first group is termed **ABSTRACT SCIENCE**, and treats of the *forms* of phenomena detached from their embodiments. The most comprehensive forms are space and time; and the sciences corresponding are mathematics and logic. The second group is **ABSTRACT-CONCRETE SCIENCE**, or the phenomena of nature analyzed into their separate elements—gravity in the abstract, heat in the abstract—as in physics and chemistry. These are two of the fundamental sciences in every scheme, and they are called abstract-concrete by Mr. Spencer, in comparison with the foregoing class. The great principle of recent introduction, termed the law of correlation, conservation, or persistence of force, serves to connect physics with chemistry, and imparts to the two taken jointly a greater unity than belongs to physics singly. The third and last group is **CONCRETE SCIENCE**, or natural phenomena in their totalities, or as united in actual things—astronomy, biology, psychology, sociology, geology, etc. Mr. John Stuart Mill, in an article in the *Westminster Review*, April, 1865, has described Comte's scheme at length, and also criticised that of Spencer. See **SPENCER**.

It may be held as generally admitted that mathematics, physics, chemistry, biology, and psychology, with or without sociology, are the sequence of the primary or fundamental sciences, and that the natural history group, from not containing any new laws of nature, are not fundamental. Astronomy, or the laws of the solar system, and of the other celestial bodies, might be called a natural history or concrete science, if we supposed a prior abstract science that discussed the operation of gravity, together with the laws of motion in bodies generally, or without special application to the existing solar and sidereal systems. The first book of Newton's *Principia* would be the abstract, the third book the concrete, form of the science.

The practical sciences do not admit of any regular classification. They are as numerous as the separate ends of human life that can receive aid from science, or from knowledge scientifically constituted. Connected with mind and society, we have ethics, logic, rhetoric, grammar, philology, education, law, jurisprudence, politics, political economy, etc. In the manual and mechanical arts, there are navigation, practical mechanics, engineering civil and military, mining and metallurgy, chemistry applied to dyeing, bleaching, etc.

The medical department contains medicine, surgery, midwifery, materia medica, medical jurisprudence. A science of living, or of the production of happiness by a skilled application of all existing resources, was greatly desiderated by Plato, and would be the crowning practical science.

SCIL'LA. See **SQUILL**.

SCIL'LY ISLANDS. These islands, situated in lat. 49° 54' n., long. 6° 21' w., are the most southern parts of the United Kingdom of Great Britain, if we except the channel islands. The group consists of about 140, comprising a circuit of about 30 m.; and their general denomination is derived from a very small island, about an acre in extent, and almost inaccessible, called Scilly, probably from its position near dangerous rocks, similar to that of Scylla near Sicily. By the ancients, these islands were named Cassiterides, Hesperides, and Siluræ Insulæ. It would seem that the term Cassiterides, or "Tin islands," under which they were known to the Greeks and Romans, was once applied to the peninsula of Cornwall. Elton, in his *Origins of English History*, affirms, however, that the Cassiterides were the headland of Galicia, or the islands of that part of the Spanish coast, and not the Sicily islands at all.

Numerous remains may be seen of rude pillars, circles of stones, kistvaens, rock-basins, and cromlechs. The granite of which the islands are composed is, in general, of a rather coarse quality, and from its color, iron seems to be frequently associated with it. There are metalliferous veins, or lodes, in some of the rocks, but none that could have yielded any considerable quantity of ore. The Scilly islands were in 936 granted by Athelstane to some monks who settled at Tresco. They were afterward granted to the abbey of Tavistock by Henry I., and were conferred by queen Elizabeth on the Godolphin family. They are now the property of the crown.

Only five of the islands are inhabited. St. Mary's, the largest, comprises 1528 acres; Tresco, 697; St. Martin's, 515; St. Agnes (a light-house station), 313; Sampson and Bryher, 269. The inhabitants are chiefly engaged in agriculture. Barley, oats, and a little wheat are grown. Large quantities of potatoes are sent to London and Bristol. Fishing, though not to any great extent, occupies some portion of the population. The climate is mild. The soil is in general sandy, but in Tresco and St. Agnes it is remarkably fertile. The cliffs abound with sea-fowl, and are covered with samphire.

The total population of the islands in 1891 was 1911. Hugh Town is the capital, and contains an odd mixture of old-fashioned and neat modern houses. The pier, built in 1750 by lord Godolphin, has been much improved. Navigation around the islands is very dangerous. The custom-house and post-office are in the center of the town.

Some remains of the old church are still seen in the fields on the southern side of the island. The modern church, at the e. side of the main street, is seated on rising ground, and forms a conspicuous object in the panorama of the islands.

At Tresco are the remains of an abbey founded in the 10th century. Among the objects of curiosity on this island are the ruins of Oliver Cromwell's camp, castle, and battery, built by the parliamentarians under Blake and Ayscough. At Dolphin down may be seen traces of ancient mining.

St. Agnes is about 3 m. s.w. from St. Mary's. It is well cultivated, and is surrounded by some fine rock-scenery. The principal attraction is the light-house, 78 ft. high, containing a revolving light, seen at a distance of 18 miles.

SCIMITER, a description of sword used among eastern nations. It is considerably curved, and has its edge on the convex side. Being usually of high temper, and its shape favorable to incision, it forms an admirable cutting instrument, but is powerless as a thrusting weapon. The scimiter is not, however, any match for the bayonet.

SCINDE. See **SINDE**.

SCINTILLATION (Lat. *scintilla*), a term applied to denote the sparkling or flickering of the stars. The phenomenon is not yet quite explained, but that it is certainly due to the earth's atmosphere is proved by the following facts, which embrace nearly all that is known on the subject. If, on a clear evening, we look at a bright star, such as Sirius, we observe that the intensity and color of its light are constantly changing—from great brilliancy to almost total obscurity, from bright red to fine blue, and so on. As it rises above the horizon, these appearances diminish in intensity; and stars near the zenith scarcely scintillate at all. Again, the amount of the scintillation depends upon the character of the weather—on some evenings, all large stars appear to scintillate strongly; on others, there is barely a trace of the appearance. It is commonly said that a planet can be distinguished from a star by the absence of scintillation. This is nearly, but not quite, true; for feeble scintillations have been occasionally observed in Mars and Venus, but very rarely in Jupiter and Saturn. One of the reasons of the non-scintillation of planets seems to be their finite apparent size; for all the more conspicuous planets show a sensible disk even in a poor telescope, while no instrument that has ever been constructed has shown a real disk in a star. Thus, a single particle or vesicle of vapor may be large enough to conceal a star for an instant, while it could have no such effect on a planet. It is pretty certain that scintillation is not due to unequally heated masses of air, since it usually modifies only the *appearance*, not the *position*, of a star. Another cause is easily seen in the comparatively feeble light of the planets. It is well ascertained that the scintillation is much less when viewed from the top of a mountain.—For a good idea of what is known, and what we desire still to know on this subject, see a paper by Prof. Dufour, *Philosophical Magazine*, 1860.

SCIO, one of the most beautiful islands in the Ægean sea, belongs to Turkey, and lies 7 m. off the coast of Asia Minor, at the entrance to the gulf of Smyrna. It is 32 m. long, and 18 m. in greatest breadth. Area 579 sq. m.; pop. variously estimated at from 36,000 to 70,000. It is mountainous in the n., and is extremely fertile. Silk, fruit, leather, figs, cheese, wool, and gum-mastic are its principal products; and its wine, which was famous in ancient times, is still esteemed. Scio, the capital, a thriving and handsome town, has a harbor and dockyards, and carries on a growing trade in fruits, confectionery, and silk and woolen goods.

In early times, Scio formed one of the 12 Ionian states, and it contributed 100 ships to the Greek force that fought and was defeated by the Persians in the sea-fight off Miletus (494 B.C.). In more recent times, the island was taken by the Genoese in 1346, and in 1566 by the Turks, in whose hands it has since, except for a short interval, remained. It was conferred as private property upon the sultana, enjoyed her protection, and consequently prospered. After it had enjoyed a long period of ease and wealth, a dreadful calamity befell the island at the outbreak of the Greek insurrection. A number of the Sciotes having, in 1822, joined the Samians, who had revolted, the island was attacked by a Turkish fleet and army, and the inhabitants, enervated by peace and wealth, were indiscriminately massacred; 25,000 fell by the sword, 45,000 were sold as slaves, and 15,000 escaped from the island. Subsequently, however, many of the Sciote families returned, and now the island is fast recovering the blow it sustained. Trade is returning; and the vineyards and the olive, citron, and mastic groves are again flourishing. On Sunday, March 27th, 1881, Scio was visited by an earthquake, and shocks continued to follow each other at intervals for the next ten days. The villages on the s. side of the island were completely wrecked, hardly a house being left standing. The district of Scio suffered most severely, the old Genoese fortress, containing about 400 houses, inhabited by Jews and Mussulmans, being destroyed by the first shock, and the ground depressed about 20 inches. The center of the volcanic action was near Nenita, overlooking Megalo bay on the e. coast of the island, where 300 persons perished out of a population of 1200. On the w. side many houses fell, but no person was killed. The first shock was vertical, followed immediately by horizontal oscillations. The population of the island was at the time about 70,000, and the total number of the

dead was about 4,000. Of the survivors, about 25 per cent were believed to have been injured. Seven of the principal villages, containing 8,570 people, lost 1327 killed. At least nine-tenths of the houses in the s. and s.e. portions of the island were destroyed, and 30,000 out of the entire population of the island were left without shelter. Subscriptions were immediately taken in the principal cities of Europe and America, and large sums were sent to the island for the relief of the wounded and the destitute, many thousands being in a starving condition.

SCIOPIUS (Latinized form of *Schoppe*), KASPAR, a noted classical scholar and controversialist, was b. at Neumark, in the Palatinate, May 27, 1576; studied at Heidelberg, Altdorf, and Ingolstadt; and in 1597, visited Italy, Bohemia, Poland, and Holland. Already he had become celebrated by his Latin verse and his notes upon different Latin authors. Next year he abjured Protestantism, and became a Roman Catholic, in consequence of which he was decorated by the pope with various titles, and received a pension of 600 florins, together with a residence in the Vatican. Henceforth, his career is a series of fierce onslaughts chiefly on his former co-religionists, but also directed against all whom accident or malice led him to hate. The first person whom he selected for attack was the illustrious Scaliger (q.v.), against whom, in 1607, he launched his *Scaliger Hypobolimæus* (Mainz). In this production, Henry IV. is also assailed. Sent in 1608 by the court of Rome to the diet of Ratisbon, for the purpose of observing the religious condition of Germany, he published in the same year more than twenty pamphlets against the Protestants, recommending the Catholic powers to use every means for their extermination. Such sentiments were, of course, highly satisfactory to the emperor of Germany, who was a devoted Catholic; and, in consequence, Scioppius, on visiting Vienna, met with a favorable reception, and was raised to the dignity of count-palatine. In 1611 he fired off two libels against king James I. of England; the first was entitled *Ecclesiasticus Autoritati Ser. D. Jacobi, Mag. Brit. Regis, Oppositus* (Hartberg), and the second, *Collyrium Regium*, etc. Some three years after, when staying at Madrid, he was dreadfully beaten by the domestics of lord Digby, the English ambassador, in retaliation for the abuse of his sovereign. Scioppius fled from Spain to Ingolstadt, where he issued his *Legatus Latro* against the ambassador. In 1618 Scioppius went to Milan, where he resided for the next 12 years, devoting himself partly to philological studies, and partly to theological warfare. He died Nov. 19, 1649. Scioppius was a prodigious scholar, and might have rivaled Scaliger himself in reputation, as he did in learning, had it not been for the infirmities of his temper and judgment. To this day, his works, especially those on the Latin language, are reckoned valuable. The principal are: *Poemata Varia* (Heidelb. 1593); *Verisimilium Libri Quatuor*, etc. (Nürnb. 1596); *Suspectæ Lectiones* (Nürnb. 1597); *De Arte Critica* (Nürnb. 1597); *Symbola Critica in Apuleii Opera* (Augsburg, 1605); *Observationes Lingue Latinæ* (Frankf. 1609); *De Rhetoricarum Exercitationum Generibus* (Mil. 1628); *Grammatica Philosophica, sive Institutiones Grammaticæ Latinæ* (Mil. 1628); *Paradoxa Literaria* (Mil. 1628); *Mercurius Bilinguis*, etc., (Mil. 1628); *Rudimenta Grammaticæ Philosophicæ* (Mil. 1629); *Astrologia Ecclesiastica* (1634); *De Scholarum et Studiorum Ratione* (Pad. 1636); *Mercurius Quadrilinguis* (Basel, 1637), etc.

SCIO TO, a river of Ohio, rises in the high lands of the n.w. portion of the state, flows s.e. to Columbus, then s. to its junction at Portsmouth with the river Ohio. It is 200 m. long, flows through a rich valley, is navigable 130 m., and for 90 m. feeds the Ohio canal. It is crossed by numerous railroads.

SCIO TO, a co. in s. Ohio, adjoining Kentucky; bounded on the s. by the Ohio river; drained by the Scioto and Little Scioto rivers and Brush creek; on the Ohio canal and the Baltimore and Ohio Southwestern, the Norfolk and Western, and other railroads; about 613 sq. m.; pop. '90, 35,377, chiefly of American birth. The surface is hilly and heavily wooded. The soil is fertile. The principal productions are corn, wheat, and grass. Much pig and forged iron is made. Co. seat, Portsmouth.

SCIP IO, PUBLIUS CORNELIUS, surnamed AFRICANUS MAJOR, one of the most accomplished warriors of ancient Rome, but whose reputation is perhaps somewhat greater than his merits, was b. 237 or 234 B.C. He is first mentioned as taking part, though only a youth, in the battle of the Ticinus (218 B.C.), where he saved his father's life. Two years later he fought at Cannæ as a military tribune, and was one of the few Roman officers who escaped from that disastrous field. In 212 B.C. he was elected ædile, though not legally qualified by age, and, in the following year, proconsul, with command of the Roman forces in Spain. His appearance there restored fortune to the Roman arms. By a bold and sudden march he captured *Nova Carthago*, the stronghold of the Carthaginians, and obtained an immense booty. His humane and courteous manners won over many of the native chiefs; and when he commenced the campaign of 209 B.C. his superiority over his opponents in address, if not in generalship, was manifest. At Bæcula, in the valley of the Guadalquivir, he defeated Hasdrubal with heavy loss, but could not prevent him from crossing the Pyrenees to the assistance of Hannibal. In 207 B.C. he won a more decisive victory over the other Hasdrubal; son of Gisco and Mago, at an unknown place called Silpia, or Elinga, somewhere in Andalusia—the effect of which was to place the whole of Spain in the hands of the Romans. Soon after he returned to Rome, where he was elected consul (205 B.C.), though he had not yet filled the office of prætor; and in the following year he sailed from Lilybæum, in Sicily, at the head of

a large army, for the invasion of Africa. His successes compelled the Carthaginian senate to recall Hannibal from Italy. This was the very thing that Scipio desired and had labored to achieve. After some abortive efforts at reconciliation the great struggle between Rome and Carthage, between Scipio and Hannibal, was terminated by the battle fought at Naragra, on the Bagradas, near Zama, Oct. 19, 202 B.C., in which the Carthaginian troops were routed with immense slaughter. Hannibal advised his countrymen to abandon what had now become a hopeless and ruinous contest, and his advice was taken. Peace was concluded in the following year, when Scipio returned to Rome and enjoyed a triumph. The surname of **AFRICANUS** was conferred on him, and so extravagant was the popular gratitude that it was proposed to make him consul and dictator for life, honors that would have been the destruction of the constitution, but which Scipio was either wise enough or magnanimous enough to refuse. When his brother, Lucius, in 190, obtained command of the army destined to invade the territories of Antiochus, Scipio served under him as legate; in fact, it was only when he offered to do so that the senate granted Lucius the province of Greece. The latter was victorious in the war, and on his return to Rome (189 B.C.) assumed (an imitation of his brother) the surname of **ASIATICUS**. But the clouds were now gathering heavily round the Scipios. In 187 B.C. Cato Major and others induced two tribunes to prosecute Lucius for allowing himself to be bribed by Antiochus in the late war. He was declared guilty by the senate, his property was confiscated, and he himself would have been thrown into prison had not his brother forcibly rescued him from the hands of the officers of justice. In 185 B.C. Scipio himself was accused by the tribune, M. Nævius; but instead of refuting the charges brought against him (and which were probably groundless), he delivered, on the first day of his trial, a eulogy on his own achievements, and opened the second day by reminding the citizens that it was the anniversary of the battle of Zama, and therefore not a time for angry squabbling, but for religious services. He then summoned the people to follow him to the capitol to give thanks to the immortal gods, to pray that Rome might never want citizens like himself. His audience were electrified, and the thing was done before opposition became possible. To resume the trial was out of the question; but Scipio felt that popular enthusiasm was not to be depended on; that the power of the oligarchy—of that compact body of ambitious and exclusive nobles—was irresistible; that its hatred of him was unappeasable, and that his day was over. He retired to his country-seat at Liternum, in Campania, where he spent the remainder of his life, and where he died, 183 or 185 B.C.—Scipio is commonly regarded as the greatest Roman gen. before Julius Cæsar; and certainly, in the brilliancy of his gifts and accomplishments, he was unsurpassed; but if his career be strictly criticised, it will be found that he owed as much to fortune as to genius. Nevertheless he won a multitude of splendid successes, and made the most of his great advantages. His beauty, bravery, and courtesy, his proud yet pious belief that the gods favored him with their inspiration, won him the love and reverence of soldiers and women; and his magnanimity toward his fallen rival, who flitted about the eastern courts in dreary exile, is a bright feature in his character, and nobly distinguishes him from the cruel-hearted oligarchs of the senate.

SCIPIO, QUINTUS CÆCILIUS METELLUS PIUS, d. B.C. 46; son of P. Cornelius Scipio Nasica; adopted son of Metellus Pius, and has been called P. Scipio Nasica as well as Q. Metellus Scipio. He divulged to Cicero the conspiracy of Catiline in B.C. 63. He was elected tribune in 60, was accused of bribery by the disappointed candidate, and Cicero took up his defense. In 53 he was nominated for the consulship, and was a leader of the Clodian mob against Milo. He was father-in-law of Pompey, who made him his colleague in 52, when he was chosen consul, they together re-establishing the consulship. His efforts were in accordance with every measure which would tend toward the overthrow of the power of Cæsar, and widen the breach between the aristocratic and democratic parties. He was an oppressive ruler of the province of Syria, where he was proconsul, was with Pompey in Greece, and after the battle of Pharsalia went to Yuba and took command of the army of Attius Varus. He was defeated at the battle of Thapsus, and again on the African coast he lost the day in an engagement with the fleet of Sithius, and rather than be taken prisoner he gave himself a mortal wound and plunged into the sea.

SCIPIO ÆMILIANUS, PUBLIUS CORNELIUS, surnamed **AFRICANUS MINOR**, b. 185 B.C., was a younger son of Lucius Æmilius Paulus, who conquered Macedon, but was adopted by his kinsman, Publius Scipio, son of the great Scipio, who had married the daughter of that Lucius Æmilius Paulus who fell at Cannæ. Scipio accompanied his father on his expedition against Macedon, and fought at the decisive battle of Pydna, 168 B.C. In Greece he made the acquaintance of Polybius the historian, who afterward became one of his closest and most valued friends. In 151 B.C. he went to Spain as military tribune, in the wake of the consul Lucius Lucullus, where he distinguished himself alike by his valor and his virtue. Two years later began the third and last Punic war, which mainly consisted in the siege of Carthage. Scipio still held the subordinate position of military tribune; but the incapacity of the consuls, Manius Manilius and Lucius Calpurnius Piso, and the brilliant manner in which he rectified their blunders, fixed all eyes upon him. The favorite both of the Roman army and the Roman people, Scipio was at length, in

147 B.C., when only a candidate for the ædileship, elected consul by an extraordinary decree of the Comitia, and invested with supreme command; old Cato, who could with difficulty be got to praise any one, applying to the young hero and his incapable comrades (according to Plutarch) the Homeric line—

He only is a living man; the rest are flitting shades.

The story of the siege of Carthage, the despairing heroism of its inhabitants, the determined resolution, the sleepless vigilance, the incessant labors of Scipio, are too well known to require description. Suffice it to say that after a protracted defense of months the city was finally taken by storm in the spring of 146 B.C.; and by the orders of the senate it was leveled to the ground, and the plowshare driven over its site. Scipio, a man of noble and refined soul, obeyed the savage behest with sorrow, even with horror. As he gazed on the ruin he had wrought the thought flashed across his mind that some day Rome too might perish, and the words of the *Iliad* rose to his lips—

The day shall come when sacred Troy shall perish,
And Priam and his people shall be slain.

Scipio, though probably the most accomplished Roman gentleman of his age, was rigorous in his observance of the antique Roman virtues; and when holding the office of censor in 142 B.C., he strove to follow in the footsteps of Cato. But his efforts to repress the increasing luxury and immorality of the capital were frustrated by the opposition of his colleague, Lucius Mummius, the rough conqueror of Corinth. In 139 B.C. Scipio was accused of the *crimen majestatis* by the tribune Tiberius Claudius Asellus, but was acquitted, and soon after was sent to Egypt and Asia on a special embassy. Meanwhile, however, affairs had gone badly in Spain. Viriathus, the Lusitanian patriot, had again and again inflicted the most disgraceful defeats on the Roman armies, and his example had roused the hopes of the Celtiberian tribes, who also rushed to war against the common foe. The contest continued with varying success; but the interest centers in the city of Numantia, whose inhabitants displayed amazing courage in the struggle with Rome. For long it seemed as if the Numantines were invincible—one consul after another finding their subjugation too hard a task—but at length, in 134 B.C., Scipio, re-elected consul, was sent over to Spain; and after a siege of eight months, forced the citizens, who were dying of hunger, to surrender, and utterly destroyed their homes. He then returned to Rome, where he took a prominent part in political affairs, appearing as the leader of the aristocratic party, in consequence of which his popularity with the democratic party greatly declined. Although a brother-in-law of Tiberius Gracchus, whose sister, Sempronia, he had married, he rather disclaimed any sympathy with his political aims; and when he heard of the murder of his kinsman, quoted his favorite Homer: "So perish all who do the like again." His attempt (129 B.C.) to rescind that portion of the agrarian law of Tiberius Gracchus relating to the lands of *Socii*, excited the most furious indignation. When he went home from the senate he had to be accompanied by a guard. Next morning he was found dead in his bed; the prevailing suspicion being that he was murdered either by or at the instigation of Papirius Carbo, his most rancorous political enemy. Scipio was neither a rigid aristocrat nor a flatterer of the people. Inferior in splendor of genius to his adoptive grandfather, he surpassed him in purity of character, in simplicity of patriotism, and in liberality of culture.

SCIRE FACIAS, in law, a writ used to enforce the execution of, or to vacate some already existing record. The sheriff is by it directed to give notice (in the Latin, *scire facias*) to the party against whom it is taken, to appear and show cause why its purpose shall not be carried out. The party resorting to it may be an original party, or a new party who claims injury from the record or wishes to take advantage of it. Records affected by it may be judicial, which are judgments or recognizances in the nature of judgments, or non-judicial, to wit: letters-patent and corporate charters. In the former case the object of the *scire facias* writ is to revive the judgment, which would otherwise lapse after the time by statute specified, or, at common law, in a year and a day. The defendant is ordered to come in and show cause why execution should not issue. If the record is in nature of a recognizance, the object is also to obtain execution. The chief case in which the writ of *scire facias* is employed, as regards non-judicial records, is to procure the repeal or forfeiture of letters-patent already issued, and in England the writ may be taken out by the crown or by an injured party. In this country, by an act of congress of 1793, the writ of *scire facias* is prescribed as the method to obtain repeal of a patent. The process must come before the United States circuit or district courts. *Scire facias* may also be brought by a state government to compel a corporation to resign its franchises and charter.

SCIR'PUS, a genus of plants of the natural order *cyperaceæ*. The English name club-rush is sometimes given to them. The common bulrush (q.v.) is a familiar example. There are several British species, some of them very small in comparison with the bulrush, as *S. cæspitosus*, called *deer's hair* in the highlands of Scotland, which is only 2 or 3 in. high, and abounds in moors, affording food to sheep in spring. The root-stocks of *S. dubius* are eaten by the natives of the s. of India; as are the tubers of *S. tuberosus*, which is called *pi-tsi* by the Chinese, and is cultivated by them in tanks and ponds, copious supplies of manure being given. The tubers are roundish.

SCIRRHUS (Gr. hard), a term applied to a kind of cancer (q.v.).

SCITAMINEÆ, or **ZINGIBERACEÆ**, a natural order of endogenous plants, herbaceous perennials. There are about 250 known species, among which are the different kinds of ginger, galangale, zedoary, cardamom, grains of paradise, turmeric, etc. Most of them are notable for their aromatic properties, which reside chiefly in their root-stalks or in their seeds. The root-stocks of some, particularly when young, contain much starch, which is used as arrow-root. All the species are tropical or subtropical.

SCIURIDÆ. See **SQUIRREL**.

SCLERODERMI, Cuvier's name for the family of fishes called *balistidæ* by Müller. See **BALISTES**.

SCLEROGENIDÆ. See **MAILED CHEEKS**.

SCLEROS'TOMA (from the Gr. *scleros*, hard, and *stoma*, the mouth) is the term applied to a well-known genus of the family *strongylidæ*, belonging to the order of round worms or nematodea (q.v.). One species, the *sclerostoma syngamus*, is of special interest, as being the cause of the disease in poultry known as the gapes (q.v.). Since the article **GAPES** was published, it has been ascertained that the entozoon which infests the wind-pipe of the diseased birds is not a trematoid (or fluke-like) worm, but a round worm, possessing many very singular properties. Dr. Cobbold, to whom we are mainly indebted for our knowledge of this worm, removed from a chloroformed fowl with the gapes, seven sclerostomata. "Six were united in pairs, the odd worm being a female, from which the male had in all likelihood been rudely torn during the withdrawal of the forceps" (*Entozoa*, 1864, p. 86). The females thus extracted had an average length of $\frac{5}{8}$ of an inch, while the males scarcely exceeded $\frac{1}{8}$ of an inch. In both sexes, the breadth of the body was nearly uniform throughout, being about $\frac{1}{8}$ of an inch in the female, and only $\frac{1}{16}$ of an inch in the male. The mouth of the female is furnished with six prominent chitinous lips. According to Siebold, after sexual congress, "there is ultimately a lasting continuity of the sexes by means of an actual growing together"—one of the most remarkable facts ever recorded in natural history. Hence the eggs, which are comparatively large, and many of which contain fully formed embryos, can only escape by a breaking-up of the body of the parent. "By whatever mode," says Dr. Cobbold, "the young make their exit from the shell, it is manifest that prior to their expulsion they are sufficiently developed to undertake an active migration. Their next habitation may occur within the bodies of certain insect larvæ, or even in small land mollusks; but I think it more likely that they either enter the substance of vegetable matters, or bury themselves in the soil at a short distance from the surface."

Considering that this worm infests the trachea of the domestic fowl, the turkey, the pheasant, and the partridge, as well as of many birds of less importance (as the magpie, the black stork, the starling, the swift, etc.), it is of the greatest importance to check its development. With this view, the worms must not only be removed by the means described in the article **GAPES**, and more fully in Cobbold's *Entozoa*, pp. 90, 91, but they must be *totally destroyed* after their removal. If they be merely killed and thrown on the ground, the mature eggs will probably remain uninjured; and when decomposition sets in, the young embryos will, sooner or later, escape from the shell, migrate in the soil or elsewhere, and ultimately find their way—how, we cannot tell—into the air-passages of certain birds, in the same manner as their parents did before them.

Dr. Cobbold, whose classification of intestinal worms will doubtless for many years be the standard one, places the *dochmius anchylostomum*, or *anchylostoma duodenale* (see **STRONGYLIDÆ**), in this genus, with the name of *sclerostoma duodenale*. This worm, which usually measures about $\frac{1}{2}$ of an inch in length, is especially characterized by an asymmetrical disposition of four horny, conical, oval papillæ, of unequal size, forming the so-called teeth. The female is larger than the male in about the ratio of 4 to 3, and is the more numerous in the ratio of 3 to 1. This worm was first discovered by Dubini at Milan in 1838, and though at first thought rare, is now known to be tolerably common throughout northern Italy. It is remarkably abundant in Egypt, where Pruner found it in nearly every corpse, sometimes in hundreds of specimens, in the jejunum, and to a less extent in the duodenum. Griesinger, in his memoir *On the Frequency of Entozoa in Egypt, and the Diseases they occasion* (1854), considers that about one-fourth of the population are constantly suffering from a severe anæmic chlorosis, occasioned solely by the presence of this parasite. A tolerably full account of this disorder, and of the treatment to be adopted, is given by Küchenmeister in his *Manual of Parasites*, vol. i. pp. 386—389.

SCLEROTIUM, a spurious genus of fungi, now regarded as merely the mycelium of fungi, and these probably of very different kinds, which have been arrested in their development, assuming a peculiar form. This form is that of a fleshy mass, often a ball. Examples are to be found among almost all kinds of decaying vegetable matter, as fruits, esculent roots, etc. When a crop of onions rots off, as is often the case, to the vexation of the gardener, a sclerotium will generally be found attached to the bulbs in the form of little irregular black masses, or as a multitude of small granules. On the under side of decaying cabbage-leaves, and scattered on the ground beneath the plant to which they belong, may in like manner be seen little balls, varying from white or red-

dish brown to dark brown and black, in size about equal to cabbage-seeds, whence stories of showers of seeds have sometimes originated.

SCLOPIS DE SALERANO, PAOLO FEDERIGO, Count, 1798-1878; educated at the university of Turin. In 1848 he was minister of justice and ecclesiastical affairs; presided over the senate, 1849-61. In 1872 he was president of the court of arbitration at Geneva under the treaty of Washington, which settled the claims of the United States against Great Britain.

SCOBY, a co. in western S. Dakota, on Cheyenne river; formed 1883; pop. '91, 32. Area, 1045 sq. m.

SCOLEX. See TAPE-WORM.

SCOLLARD, CLINTON, American poet, was born in Clinton, N. Y., Sept. 18, 1861. He graduated at Hamilton college and studied for two years at Harvard, and later in Cambridge university, England. He then traveled visiting Greece, Italy, and Palestine. He was professor of English literature in Hamilton college. He has published *Pictures in Song* (1884); *With Reed and Lyre* (1886); *Old and New World Lyrics* (1888); *Giovio and Giulia* (1891); *Songs of Sunrise Lands* (1892); *Hills of Song* (1896); and has edited Ford's *Broken Heart*.

SCOLOPA CIDÆ, a family of birds of the order *grallæ*, having a long, feeble, soft, and somewhat flexible bill, which is remarkably furnished with nerves, particularly toward the tip, so as to be extremely sensitive, whilst many of them have also a peculiar muscle, enabling them to separate the points of the mandibles the moment that their prey is felt. They are thus admirably fitted for seeking their food—which generally consists of worms, slugs, etc.—in mud, soft earth, or wet sand. The membrane of the tip of the bill is almost pulpy in many of them. The species are numerous, and very widely distributed, generally inhabitants of swampy or very moist places. Snipes, woodcocks, sand-pipers, and curlews are familiar examples.

SCOLOPENDRA. See CENTIPEDE.

SCOLOPENDRIUM. See HART'S TONGUE.

SCOLYTUS, a genus of coleopterous insects of the family *xylophagi*. See BARK-BEETLE. One species, *S. destructor*, a beetle only about one-sixth of an inch in length, of a dull color, with short antennæ, thickened at the extremity, has of late years destroyed great numbers of fine elms in the neighborhood of London and elsewhere in England. The female insect burrows in the wood, and lays a row of eggs; the larvæ, as soon as they are hatched, begin to feed upon the wood, and eat their way in long tunnels, diverging on all sides from the original one. This pest appears to be spreading in England.

SCOMBERESOCIDÆ, a family of fishes, of the order *plectognathi*, having the maxillary bones united with the elongated premaxillaries at the corners of the mouth. The flying-fish (*exocetus*) belongs to this family, also the gar-fish, of which there are more than 20 species, all of them American. Until the plectognathi were recognized as a separate order, the scomberesocidæ were reckoned as belonging to the *esocidæ*, or pike family.

SCOMBERIDÆ, or **SCOMBRIDÆ**, a large family of acanthopterous fishes, containing many species highly esteemed as articles of food, and some of them of great value on account of the abundance in which they are caught. Some of them attain a large size. They have a smooth body, covered generally with small scales, and often very beautifully colored; the tail-fin generally large, and the tail very muscular and powerful. The gill-covers have no armature. The sides of the tail are often keeled and armed with sharp-keeled scales. The front spines of the anal fin are generally detached, and sometimes those of the first dorsal fin. The second dorsal fin is often represented by numerous finlets, as in the mackerel (q.v.). To the same tribe with the mackerel, characterized by finlets and by the want of armature on the lateral line, belong the bonito (q.v.), the tunny (q.v.), the albacore (see TUNNY), and the seirfish. The importance of the mackerel fishery is well known, also that of the tunny fishery of the Mediterranean. The sword-fish (q.v.) is an example of another group, comprising only a few species, having no finlets, and remarkably characterized by the dagger-like prolongation of the muzzle. The pilot-fish (q.v.) belongs to a tribe having the first dorsal represented by isolated spines. There are other tribes or groups, some having the lateral line cuirassed, some not having this armature, and not having finlets nor detached spines. The dory (q.v.) and allied genera, often regarded as forming a tribe of scomberidæ, have been constituted into a distinct family, *zeidæ*.—The scomberidæ are all marine. They are more numerous in warm than in cold climates, although some are found in very northern seas, of which the mackerel is the most important instance.

SCONE (pronounced *Scoon*), a parish in Perthshire, lying on the left bank of the Tay, about 2 m. from Perth. It is famous as the seat of one of the most venerable of Scottish abbeys. Scone is first mentioned in the beginning of the 10th c., when a council was held there in the 6th year of the reign of king Constantine, at which time it is styled by the chronicle which records the fact, *regalis civitas*, the royal city. A monastery was built at Scone probably about the same period, and there was located the famous stone on which the kings of the Scots were inaugurated, and which was carried by Edward I. of England to Westminster abbey. In place of the ancient monastery, an abbey of can-

ons regular was founded by Alexander I. in 1115, and there the sovereigns continued to be inaugurated and crowned. Alexander III., the last of the ancient race of kings, and Robert Bruce, the founder of the new dynasty, were crowned at Scone; but after the accession of the house of Stuart, the coronation sometimes took place in other churches. In the summer of 1559, when Perth was held by the lords of the congregation, a disorderly multitude of their adherents assaulted the monastery of Scone, set it on fire, and left it a blackened ruin. The last coronation which was celebrated at Scone was that of Charles II. on Jan. 1, 1651. The abbey church had never been restored, and the solemnity took place in the parish kirk, the crown being placed on the king's head by the marquis of Argyle. In Jan., 1716, the Jacobite leaders endeavored to encourage their followers by fixing a day for the coronation of the chevalier at Scone, but the design was abandoned. In the reign of James VI. the abbey of Scone was erected into a temporal lordship in favor of sir David Murray, afterward created viscount of Stormont. The great chief-justice, the earl of Mansfield, a younger son of the fifth viscount Stormont, was born at Scone; and the Scottish peerage is now merged in the British earldom. The viscounts of Stormont had a residence near the site of the abbey, and hence known as the palace of Scone. The present palace was erected on the same site in the beginning of this century.

SCOPAS, a celebrated Greek sculptor and architect, belonging to the later Attic school, the head of which was Praxiteles (q.v.), was b. in the island of Paros, and flourished during the first half of the 4th c. B.C. Nothing is known regarding his life or the period of his death. His principal architectural works are: "The Temple of Athena Alla at Tegea," the first both in point of size and beauty in the Peloponnesus; "The (second) Temple of Diana at Ephesus" (though Deinocrates is also and even more generally named as the architect of this building); some of the bas-reliefs in the famous mausoleum erected by Artemisia, queen of Caria, in memory of her husband (and now in the British museum). His sculptures, by which we mean his single statues and groups illustrating the divinities of Greek mythology, were very numerous, and for the most part were executed in marble. They embrace subjects from the myths of Aphrodite (Venus), Dionysus (Bacchus), Apollo, Artemis (Diana), etc. But perhaps the noblest, and certainly the most famous piece of sculpture executed by Scopas was that which latterly stood in the Flaminian circus at Rome, and represented Achilles conducted to the island of Leuce by the divinities of the sea. It included statues of Neptune, Thetis, the Nereids, Tritons, and a variety of sea-monsters, and, according to Pliny, the whole was so beautiful that it would have been sufficient to have immortalized Scopas, even if he had done nothing more.

SCOPELIDÆ. See SALMONIDÆ.

SCORE, in music, compositions for several voices or instruments, or for an orchestra, so written that each part has a separate staff for itself, these staves being placed over each other, bar corresponding to bar. It is so called because the bars are *scored* or drawn through all the parts from top to bottom. Occasionally, where there is a deficiency of staves for all the parts, or where any of the parts have so little to do that it is not worth while to assign them a separate staff, parts related to or connected with each other, as two flutes, two clarionets, or three trombones, may be written on the same staff together. The arrangement or distribution of the parts is matter of some importance. As a general rule, the highest part should be placed uppermost, then the next lower, and gradually descending. All the parts of a chorus should be placed together. Perfection in reading score is not very easily attained, but is necessary for a thoroughly trained musician. The student of music who can read or play the great master-works from the score, will become far more intimately acquainted with them than he could by mere pianoforte arrangements, and will come to understand the means by which their composers have produced the wonderful effects that are to be found in their music. The use of so large a number of clefs, and the practice which has obtained of writing parts for particular instruments in other keys, have added greatly to the difficulty of studying the score. Among various suggestions for simplifying the score, one which was lately advocated in Brown's *Elements of Musical Science*, consists in the use of but one clef, the bass or F clef, the other parts being distinguished from the bass by short bars attached to the clef, which direct the performer to take the notes one, two, or three octaves higher.

SCORESBY, WILLIAM, D.D., a celebrated Arctic explorer and savant, was the son of William Scoresby, the most distinguished whale-fisher of his time, and was born at Crop-ton in Yorkshire, Oct. 5, 1789. He commenced a sea-faring life at the age of 10, and in his 21st year succeeded his father as commander of the *Resolution*, and carried on the business of whale-fishing. After having made 17 voyages to the Spitzbergen and Greenland whaling-grounds, he published the results of his observations of the countries within the Arctic circle in *An Account of the Arctic Regions* (2 vols., 1820), a work which not only increased and extended the author's reputation, but added largely to the sciences of meteorology, hydrography, and natural history. In 1822 he explored the e. coast of Greenland, a tract hitherto wholly unknown, and published in the following year at Edinburgh an account of this expedition and its fruits. In 1824 he was elected a fellow of the royal society of London, and some time after was chosen *correspondant*

of the French Institute. He had retired from his profession in 1822, and now proceeded to give effect to a strong desire which had long possessed him, of becoming an authorized teacher of religion, by entering himself at Queen's college, Cambridge; he graduated as B.D. in 1834, subsequently (1839) received the degree of D.D., and labored faithfully and zealously, first at Liverpool and afterward at Bradford, till failing health compelled him to retire to Torquay. He still continued his physical researches, giving special attention to terrestrial magnetism, especially in its relation to navigation; and published the results, many of which were of great value and interest, in the form of memoirs in the *Philosophical Transactions*, the *Transactions of the Royal Society of Edinburgh*, the *Reports of the British Association*, and subsequently in an improved form in his *Magnetical Investigations* (Lond. 2 vols. 1839-52). For the better prosecution of these researches he made a voyage to the United States in 1847, and to Australia in 1853, returning from the last-named country in 1856, enfeebled in health by the arduous labors which he had undergone. He died at Torquay on Mar. 21, 1857. Besides his work on *Zoistic Magnetism*, which described a series of researches entered into for the purpose of eliciting some natural connection between magnetic and mesmeric agencies, he published various works of a religious nature. His life has been written by his nephew, R. E. Scoresby-Jackson (Lond. 1861).

SCORIAE are the cinders and slags of volcanoes, more or less porous from the expansion of the gases contained in the melted materials. See **VOLCANOES**.

SCORPÆNA, a genus of fishes, of the family of *mailed cheeks*. The head is large and compressed, more or less armed with spines or tubercles. The body is of a somewhat perch-like form. Some of the *scorpænae* are remarkable for their ugliness; some exhibit very fine colors. They are numerous in the Mediterranean, and widely distributed in the seas of warm climates. They frequent rocky shores in shoals, and feed on crustaceans, small fishes, etc. They are popularly called *hog-fish* and *scorpion-fish*. The flesh is dry and tasteless, but the liver yields a useful oil.—The bergylt (q.v.) belongs to a nearly allied genus.

SCORPION, *Scorpio*, a genus of *arachnida*, of the order *pulmonaria*, formerly including the whole of the family *scorpionidæ*, to all of which the popular name is still extended. Scorpions are natives of warm climates, both in the eastern and western hemispheres. The species are numerous. They have the body elongated, and no marked division between the thorax and abdomen. Six segments of the abdomen are broad; but the last six are narrow, forming a tail; and the last segment is modified into a curved and sharp sting, having two pores on its lower side, from which the venom flows, supplied by two poison-glands in the base of the segment. The palpi are modified into pincers or claws like those of the lobster, by means of which prey is seized. There are four spiracles or breathing pores on each side of the abdomen. There are two remarkable comb-like appendages on the under surface of the thorax, the use of which is unknown. The number of eyes is various; in the restricted genus *scorpio*, of which the COMMON SCORPION (*S. Europæus*) of the south of Europe is an example, there are only six; but in some of the genera eight and twelve. Scorpions feed on beetles and other insects, and after seizing them, pierce them with the sting before eating them. They also eat the eggs of spiders, etc. They lurk under stones and in holes and crevices, but come forth to seek their prey, running with great activity. In running, they carry the tail curled over the back. When alarmed or irritated, they show great fierceness, evidently aware of the power of their sting, and moving it in all directions, as if threatening an adversary. They are universally disliked, and not a little dreaded, being apt to get into houses, and into beds, hiding themselves under pillows, in shoes, boots, etc., so that accidents are very frequent in countries where they abound. The sting of a scorpion is seldom fatal, but even that of the common European scorpion is very painful, and that of some of the largest species—which are 6 in. long—is much more severe, attended with much nausea and constitutional derangement, nor do the effects soon cease. It is of use to press a large key or other tube on the wound, so as to force out part of the poison. The best remedy is ammonia, internally administered, and also applied externally.

The female scorpion displays great regard for her young, which she carries for some time clinging in great numbers to her back, limbs, and tail. See *illus.*, **INSECTS**, vol. VIII.

SCORZONE RA, a genus of plants of the natural order *compositæ*, sub-order *cichoraceæ*, having yellow or rarely rose-colored flowers. The species are numerous, mostly natives of the s. of Europe and the east. No species is found in Britain. The common scorzonera of our kitchen-gardens, *S. Hispanica*, a native of the s. of Europe, has long been cultivated for its esculent roots. The root is black externally, white within, about the thickness of a man's finger, long, and tapering very gradually, whence the name *viper's grass*, sometimes given to the plant, the root being supposed to resemble a viper. It contains a white milky juice, and has a mild, sweetish, mucilaginous taste; it is very pleasant when boiled, the outer rind being first scraped off, and the root steeped in water, to abstract part of its bitterness. The leaves are an inferior substitute for mulberry leaves in feeding silkworms.—Other species of scorzonera are used in this way.

SCOT, REGINALD, a writer who has acquired an honorable reputation as an early disbeliever in the reality of witchcraft, was a youngerson of sir John Scot of Scotshall, near Smeeth in the co. of Kent, and was born in the first half of the 16th century. He studied at Oxford, and on his return home devoted himself exclusively to learned pursuits. Nothing further is known regarding him except that he died in 1599. His famous work, entitled *The Discoverie of Witchcraft*, was published in 1584, and is designed to demonstrate the absurdity of the prevalent belief on the subject. It is full of learning, and is marked in many passages by sound sense and humane feeling, qualities that naturally excited the antipathy of a person like king James, who wrote his *Demonology*, as he tells us, "chiefly against the damnable opinions of Wierus and Scot; the latter of whom is not ashamed in public print to deny there can be such a thing as witchcraft." But the "British Solomon" only reflected the general ignorance and superstition of his age, and Scot had to run the gantlet of a series of "answers" and "refutations" by a number of "eminent" divines, as well as by Glanvil, the author of the *Scepsis Scientifica*. Scot's book was ordered to be burned by the common hangman, and copies of it are now extremely rare. Besides *The Discoverie of Witchcraft*, Scot wrote *A Perfect Platform of a Hop Garden*.

SCOTCH-IRISH, the descendants of Scotch settlers in Ulster, Ireland. In 1608 the estates of the rebel earls of Tyrone and Tyrconnell in the counties Armagh, Gavan, Termanagh, Derry, Tyrone, and Donegal, were forfeited to the crown, and the fertile land cleared of disloyal Irish and parceled out to Scotch and English settlers. For three centuries before this Helvidians had been forming settlements in Antrim, their chief, McDonnell, having been created Earl of Antrim, while Lowlanders flocked in large numbers into this county and Down. These were largely augmented by refugees from the persecution under Charles II. All these coalesced into one Presbyterian people whose descendants now number about half a million. Belfast, towards which the Scotch tended to converge, shows signs of the Scotch thrift, shrewdness, energy, and prosperity.

SCOTCH PEBBLE. A kind of agate occurring in considerable quantities in Scotland, and familiarly known to lapidaries by this name. It consists principally of chalcedony, with mixtures of common quartz, and occasional patches of jasper and opal. The composition is not uniform, but usually contains from 70 to 96 per cent. of silica, with varying proportions of alumina. The colors are chiefly gray, white, and yellow, or brownish-red. Scotch pebble commonly occurs in rounded nodules, or in veins in trap rocks, which, when decomposed by the elements, the stones drop out, and are found in the beds of streams that descend from the ledges; or they may be obtained by quarrying.

SCOTCH STATUTES frequently mean the ancient acts of parliament beginning with the reign of James I. of Scotland, and continuing down to the union of England and Scotland.

SCOTCH VERDICT. In Scotland, a jury are allowed in certain instances, where the testimony is not sufficient to justify them in bringing in a verdict of "guilty" to say instead "not proven." An example in fiction is given by Wilkie Collins in *The Law and the Lady*.

SCO TIA. See MOULDINGS.

SCOT LAND. For the geography, see GREAT BRITAIN. *History*.—An account has been given under the article Picts (q.v.) of the early inhabitants of the country which has long been known by the name of Scotland. The original Scotia or Scotland was Ireland, and the Scoti or Scots, at their first appearance in authentic history, were the people of Ireland. The Scots were a Celtic race, and their original seat in northern Britain was in Argyle, which they acquired by colonization or conquest, before the end of the 5th c., and from whence they spread themselves along the western coast from the firth of Clyde to the modern Ross. The name of Scotland seems first to have been given to the united kingdom of the Picts and Scots in the 10th century. It was then sometimes styled, by way of distinction, *Scotia Nova* (New Scotland), and it was a considerable time afterwards before the name of Scotland was applied to it, to the exclusion of Ireland. This interchange of names was a fruitful source of dispute between Irish and Scottish writers in the 16th and following centuries, and it can hardly be said that even now the controversy is entirely at an end.

The first prince of the British Scots mentioned in our authentic annals was Fergus, son of Ere, who crossed over to Britain about the year 503. His nation had been converted to Christianity by St. Patrick, and Fergus himself is said to have received the blessing of the saint in his early years. His great-grandson, Conal, was king of the British Scots when Columba (q.v.) began the conversion of the northern Picts; and by that prince, according to the best authorities, Iona was given for the use of the mission. Conal was succeeded by his nephew, Aidan, who was inaugurated as sovereign by St. Columba in the island of Iona—a ceremony which Scottish writers, misled by the great French antiquary Martene, long believed to be the first example of the benediction of kings. Aidan was a powerful prince, and more than once successfully invaded the English border, but toward the end of his reign he received a severe defeat from the Northumbrian sovereign Ethelfrid at the battle of Degsestan.

The history of Aidan's successors is obscure and uninteresting, except to the professed students of our early history. Their kingdom was overshadowed by the more powerful monarchy of the Picts, with which, as well as with its neighbors in the s.—the Britons of Cumbria—it was engaged in almost unceasing conflict. The Scots were for a time under some sort of subjection to the English of Northumbria, but recovered their independence on the defeat and death of king Egfrid in battle with the Picts at Nechtansmere in 685. In the middle of the 9th c., by a revolution, the exact nature of which has never been ascertained, the Scots acquired a predominance in northern Britain. Kenneth, son of Alpin, the lineal descendant of Fergus and Aidan, succeeded his father as king of the Scots in 836. The Pictish kingdom was weakened by civil dissension and a disputed claim to the crown. Kenneth laid claim to it as the true heir in the female line, and was acknowledged king in the year 843.

King Kenneth transferred his residence to Forteviot in Stratherne, which had been the Pictish capital, fixing soon afterward the ecclesiastical metropolis of the United Kingdom at Dunkeld, where he built a church, dedicated to St. Columba. The Picts and Scots, each speaking a dialect of the Celtic tongue, gradually coalesced into one people, whose territory extended from the firths of Forth and Clyde to the northern extremity of Britain. The crown descended to a line of princes of the family of Kenneth, whose rule gave a unity and comparative tranquillity to the Scots of Britain, which those of Ireland, at no time really united under one prince, never possessed, and the good effects of which, as contrasted with the state of the sister island, are experienced to the present day. The first interruption to the descent of the crown in the line of Kenneth was the reign of a usurper named Grig, round whose name, amplified to Gregory by the writers of a later age, a cloud of legendary fiction gathered. The old family was restored on his expulsion in 893.

The reign of Constantine, son of Aodh, who succeeded in 904, was a remarkable one. In his time, it is probable that the seat of the ecclesiastical primacy was transferred from Dunkeld to St. Andrews, and that the regal residence was fixed at Scone. At the latter place, in the sixth year of his reign, the chronicles mention that Constantine the king, Kellach the bishop, and the Scots, swore to observe the laws and discipline of the faith and the rights of the churches and the gospels. This seems to indicate the meeting of some sort of council, civil or ecclesiastical, or more probably a combination of both, according to the form prevalent at this period both among the Celtic and the Teutonic nations. Even before the establishment of the kingdom of the Picts and Scots in the person of Kenneth, northern Britain had experienced the attacks of a new enemy, the Scandinavian invaders, generally spoken of under the name of Danes. Constantine resisted them bravely, but toward the end of his reign he entered into an alliance with them in opposition to the English. A powerful army, composed of Scots and Picts, Britons, and Danes disembarked on the Humber, and was encountered at Brunanburgh by Athelstane, king of England. A battle was fought there, the first of a series of unfortunate combats by Scottish princes on English ground. The confederate army was defeated, and though Constantine escaped, his son was among the slain. Weary of strife, the king soon afterward retired to the Culdee monastery at St. Andrews, of which he became abbot, and where he died in 953.

During the reign of Malcolm the first of that name, and the successor of Constantine, a portion of the Cumbrian kingdom, including the modern Cumberland and part of Westmoreland, which had been wrested from the Britons by Edmund, king of England, was bestowed by that prince on the Scottish sovereign. This grant was the foundation of that claim of homage made by the English kings on the Scottish sovereigns, which afterward became the cause or the pretext for the great struggle between the two nations. The northern kingdom was still further increased in the reign of Kenneth, son of Malcolm, by the acquisition of Lothian, and of northern Cumbria, or Strathclyde. The former province, formerly a part of the Northumbrian kingdom, and entirely English in its population, was bestowed on Kenneth by Edgar, king of England. The Cumbrian kingdom, which had at one time extended along the w. coast from the firth of Clyde to the border of Wales, had been weakened by the loss of its southern territories; and it now fell under the dominion of the Scottish king. The last addition to Scotland in the s. took place under Malcolm II., son of Kenneth, who acquired the Merse and Teviotdale, from the earl of Northumbria, and thus advanced his kingdom on the eastern border to the Tweed. The reign of Malcolm II. extended from 1003 to 1033. The kings who immediately followed are better known to the general readers than any of their predecessors, poetry having made their names familiar to every one. Malcolm's successor was his grandson, Duncan, whose brief reign was followed by that of Macbeth (q. v.). The latter was a vigorous and prudent ruler, munificent to the church, and famous as the only Scottish king who made a pilgrimage to Rome. But although by marriage he was connected with the royal line, he was unable to secure the affection of his subjects. Malcolm, the eldest son of Duncan, assisted by his kinsman, Siward, earl of Northumbria, invaded Scotland. The usurper was defeated and slain at Lumphanan, in Mar., in 1056, and Malcolm was acknowledged as king.

The long reign of Malcolm III. was the commencement of a great social and political revolution in Scotland. His residence in England, and still more his marriage with the English princess Margaret, the sister of Edgar Atheling, led to the introduction of Eng

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lish customs, the English language, and an English population into the northern and western districts of the kingdom, which hitherto had been for the most part inhabited by a Celtic race. The influx of English colonists was increased by the tyranny of William the conqueror and his Norman followers. All received a ready welcome from the Scottish king, whose object it was to assimilate the condition of the Scots, in every respect to that of their fellow-subjects in Lothian; and what his stern, though generous, character might have failed to accomplish, was brought about by the winning gentleness and Christian graces of his English queen.

Malcolm fell in battle before Alnwick castle in the year 1093, and Margaret survived only a few days. On this event, it seemed as if the work of their reign was about to be utterly overthrown. The Celtic people of Scotland, attached to their old customs, and disregarding the claims of Malcolm's children, raised his brother, Donald Bane, to the throne. The success, however, of this attempt to restore a barbarism which the better part of the nation had outgrown, was of brief duration; Donald was dethroned, and Edgar, the eldest surviving son of Malcolm and Margaret, was acknowledged as king. The very name of the new sovereign marked the ascendancy of English influence. That influence, and all the beneficial effects with which it was attended, continued to increase during the reigns of Edgar and his brother and successor, Alexander I. The change went steadily on under the wise and beneficent rule of David (q.v.), the youngest son of Malcolm. His reign, which extended from 1124 to 1153, was devoted to the task of ameliorating the condition of his subjects, and never was such a work more nobly accomplished. David was in every respect the model of a Christian king. Pious, generous, and humane, he was at the same time active and just, conforming himself to the principles of religion and the rules of the church with all the devotion of his mother, but never forgetting that to him, not to the clergy, God had committed the government of his kingdom. He was all that Alfred was to England, and more than St. Louis was to France. Had he reigned over a more powerful nation, his name would have been one of the best known among those of the princes of Christendom. As it is, every Scottish scholar has delighted to do his character justice. At the time of David's accession, Scotland was still but partially civilized, and it depended in a great measure on the character of its ruler whether it was to advance or recede. It received a permanent stamp from the government of David. The Celtic people were improved morally socially, and ecclesiastically, and all along the eastern coast were planted Norman, English, and Flemish colonies, which gradually penetrated into the inland districts, and established the language and manners of that Teutonic race which forms the population of the greater part of Scotland. David encouraged and secured the new institutions by introducing a system of written law, which gradually superseded the old Celtic traditional usages, the first genuine collections of Scottish legislation belonging to his reign. David was as great a reformer in the church as in the state. The ecclesiastical system prevalent in Scotland almost up to his time differed in some points from that established in England and on the continent, bearing a great resemblance to that of Ireland, from which it was indeed derived. David established dioceses, encouraged the erection and endowment of parishes, provided for the maintenance of the clergy by means of tithes, and displacing the old Celtic monastic bodies, introduced the Benedictine and Augustinian orders.

David, though devoting his energies to the improvement of his subjects in the manner which has been mentioned, did not forget duties of a less agreeable kind. He knew that a Scottish king really held his crown by the tenure of the sword, and none of his fierce ancestors was a more intrepid warrior than the accomplished and saintly David. His skill and courage were shown, though without success, at the battle of the Standard. As the representative through his mother of the ancient kings of England, he had many friends in that country; and had the Scottish army been successful, the history of the two kingdoms might in some respects have been different. As it was, he contented himself with maintaining the cause of his sister's child, the empress Matilda, against king Stephen.

David's grandson and successor, Malcolm IV., reigned for twelve years, and the next king was William the Lion, Malcolm's brother, who ruled from 1165 to 1214. These princes pursued the policy of their grandfather with equal resolution, though sometimes with less success. They were embarrassed by their connection with the English king Henry II., who took advantage of his superior power and ability to impose unwise and unjust restraints on the independence of the Scottish sovereigns and their kingdom—a policy which laid the foundation of the unhappy national strife of after-years. This was averted for a time by the concessions of Richard I. in 1189. "For more than a century," says lord Hailes, "there was no national quarrel, no national war between the two kingdoms—a blessed period." That period was well employed by the next two kings, Alexander II. and Alexander III., the son and grandson of William the Lion, to consolidate the institutions of their kingdom, and extend and confirm what had been begun by David. Alexander III. was one of the ablest and best of the Scottish kings. By a treaty with the king of Norway, he added to his kingdom Man and the other islands of the western sea, held by the Norwegians. His sudden death, in 1286, was one of the greatest calamities with which Scotland could have been afflicted. It closed a period of prosperity—a course of improvement—which the kingdom did not again enjoy for nearly

500 years. The history of this interesting period has yet to be written. The only modern account of any value is that in the accurate but meager annals of lord Hailes. Tytler begins his history with the reign of Alexander III.; and Robertson, in his narrative of two reigns—which in popular language is called the history of Scotland, just as lord Macaulay's similar work is called the history of England—speaks of what took place during the whole time from the union with the Picts to the death of Alexander III., as "events which may be slightly touched, but merit no particular or laborious inquiry."

On the death of the infant granddaughter and heiress of Alexander III., in 1290, the succession to the crown was disputed. The question between the two chief claimants, Baliol and Bruce (q.v.), was not free from doubt according to the customs of the time; and Edward I. of England, to whom the decision was referred, appears at first to have acted with good faith. But this great king, who had already subdued Wales, was now bent on uniting the British Islands under one scepter; and in the pursuit of that object he sacrificed humanity, honor, and justice. The results were most deplorable. The national spirit of the Scots was finally roused, and after a long struggle under Wallace and Bruce they secured their independence on the field of Bannockburn (q.v.). The battle of freedom was won; but it was at the expense of tranquillity and civilization. The border counties were continually wasted by the English; the central provinces were the scene of frequent warfare among the chief nobles; and the highland districts became more and more the seat of barbarism, the Celtic tribes re-acquiring something of their old ascendancy, just as they did in Ireland in the troubled times which followed the invasion of Edward Bruce. The strong arm of king Robert might have repressed these disorders, had his life been longer spared after the treaty of Northampton; but his death, and the accession of an infant son, again plunged the country into all the miseries of foreign and civil war. When that son, David II., grew up to manhood, he proved in every respect unworthy of his great father. His reign, and that of his successors Robert II. and Robert III., the two first princes of the house of Stewart, were the most wretched period of Scottish history. In the year 1411, half of the kingdom would have become absolutely barbarous, if the invasion of the lord of the Isles had not been repulsed at Harlaw (q.v.), by the skill of the earl of Mar, and the bravery of the lowland knights and burgesses.

A happier time began to dawn on the release of James I., in 1424, from his English captivity. The events of the following period are better known, and a brief notice of the most important will be sufficient. Reference may be made for details to the accounts of the particular kings. The vigorous rule of James I. had restored a tranquillity to which his kingdom had long been unaccustomed; but strife and discord were again brought back on his assassination. One of the most calamitous features of the time, was a succession of minorities in the sovereign. James himself had succeeded when a child and a captive; James II., James III., James IV., James V., Mary, and James VI., all succeeded while under age, and all, except James IV., when little more than infants. The courage and ability shown by almost all the Stewart princes were insufficient to repair the mischiefs done by others in the beginning of their reigns, and to abate the great curse of the country—the unlimited power and constant feuds of the nobles. The last addition to the Scottish kingdom was made in the reign of James III., when the islands of Orkney and Zetland were made over to him as the dowry of his queen, Margaret of Denmark. The marriage of James IV. with Margaret of England was far more important in its ultimate results, and brought about in the reign of his great-grandson that peaceful union with England which the death of the maiden of Norway had prevented in the 13th century. Many good laws were enacted during the reigns of the Jameses; but the wisdom of the Scottish legislature was more shown in framing them than the vigor of the government in enforcing them. Among the most important improvements of the period was the establishment of universities—the first of which, that of St. Andrews, was founded during the minority of James I.—and the institution of the college of justice in the reign of James V.

During the reign of the fifth James, religious discord added another element to the evils with which Scotland was afflicted. The practical corruptions of the church were greater than they were almost in any other country in Europe, and one of the consequences was, that the principles of the reformation were pushed further than elsewhere. The first great ecclesiastical struggle had hardly ceased, by the overthrow of the Roman Catholic system, when the strife began anew in the reformed communion in the shape of a contest between Episcopacy and Presbyterianism, the former being supported by the sovereign, the latter by the common people, the nobles throwing their weight into either scale as it suited their policy at the time. James VI. struggled hard to establish an absolute supremacy, both in church and state, in opposition to a powerful party, which admitted no royal authority whatever in the former, and very little in the latter. After his accession to the English crown, he was apparently successful in carrying out his designs, but during the reign of his son, Charles I., the contest again broke out with increased bitterness. The nobility, whose rapacity had been checked by the sovereign, joined the popular party. The opponents of the crown bound themselves together, first by the national covenant, and afterward in alliance with the English Puritans, by the solemn league and covenant. Their efforts were completely successful, but their success led to the utter overthrow of the monarchy by Cromwell.

The restoration of Charles II. was welcomed by all classes, wearied as they were of a foreign and military rule, but especially by the nobles and gentry, who had learned by bitter experience that the humiliation of the sovereign was necessarily followed by the degradation of their order. Had the government of Charles II. and James VII. been reasonably just and moderate, it could hardly have failed in securing general support; but unfortunately it was more oppressive and more corrupt than any which Scotland had experienced since the regencies in the minority of James VI. The natural result was the revolution, which seated William and Mary on the throne.

Hardly had the majority of the nation been successful in this, when many of them began to repent of what they had done, and Jacobitism became more popular than royalist principles had ever been when the house of Stewart was on the throne. The discontent was greatly increased by the fears entertained of English influence. The state of matters grew so threatening after the accession of queen Anne, that the ruling English statesmen became satisfied that nothing short of an incorporating union between the two kingdoms could avert the danger of a disputed succession to the throne, and of a civil war. Supported by some of the ablest and most influential persons in Scotland, they were successful in carrying through their design, though it was opposed by a majority of the Scottish people. The act of union was formally ratified by the parliament of Scotland on Jan. 16, 1707. It subsequently received the royal assent, and came into operation on May 1, of the same year. The union continued to be unpopular in Scotland for many years, and unpopularity increased by the corrupt means freely used to carry it through. But the discontent gradually ceased, and the ultimate consequences of the measure have been mostly beneficial to both kingdoms.

A few words may be added regarding the parliament of Scotland. That body was originally composed, like the English parliament, of three classes—the ecclesiastics (consisting of bishops, abbots, and priors), the barons, and the burgesses. The spiritual lords, during the establishment of episcopacy after the reformation, were composed of bishops only. When Presbyterianism was established at the time of the covenant, and when it was formally ratified by law at the revolution, the ecclesiastical estate ceased to have any place in parliament. The barons, or immediate vassals of the crown, at first sat in their own right, whether holding peerages or not; but afterward the peers alone sat, the others sending their representatives. The burgesses were the representatives of the burghs. All the three estates sat to the very last in one house, the sovereign presiding in person, or through a commissioner named by him.

It would be impossible within reasonable limits to give a complete account of the original authorities for the history of Scotland. The principal ones are the following. For the period before the accession of David I.—Venerable Bede, the *Early Lives of the Saints*, the *Irish Annals*, the brief *Scottish Chronicles* published by Innes and Pinkerton, and the ancient *English Chroniclers*. For the subsequent period down to the reformation—the *Chronicles of Melrose and Lanercost*, the *Scotichronicon* of Fordun and Bower, Winton's *Chronicle*, Leslie's and Buchanan's *Histories*, the *English Chroniclers*, and the *Ecclesiastical Chartularies*, and the *Acts of the Scottish Parliament*. For the period from the reformation to the union—Knox's, Calderwood's, Spottiswood's *Histories*, Baillie's *Letters*, Wodrow's and Burnet's *Histories*, the *Acts of Parliament*, and the *State Papers*. The chief modern authorities are Innes's *Critical Essay on the Ancient Inhabitants of Scotland*, Pinkerton's *Inquiry into the History of Scotland*, Chalmers's *Caledonia*, Hailes's *Annals*, and Tytler's, Robertson's, Laing's, and Burton's *Histories of Scotland*, the *Domestic Annals of Scotland*, by R. Chambers, and Skene's *Celtic Scotland*. See the article GREAT BRITAIN.

SCOTLAND, a co. in the n.e. Missouri, adjoining Iowa; drained by the Wyaconda, the north Fabius, and the middle Fabius rivers; on the Keokuk and Western railroad; about 440 sq. m.; pop. '90, 12,674, chiefly of American birth. The surface is rolling and heavily wooded. The soil is fertile. The principal productions are corn, oats, hay, and live stock. Co. seat, Memphis.

SCOTLAND, CHURCH OF. An account has already been given of the conversion to Christianity of the early settlers of Scotland. See COLUMBA, CULDEES, NINIAN, PICTS, SCOTLAND, *History*. The doctrines of the ancient Scottish church were precisely the same as those of the rest of western Christendom. In ritual there were some points of difference, but they were so slight that the most important related to the time of observing the Easter festival. In these, also, the Scots gradually conformed to the usage of the Roman and English churches. In one point, however, there continued for several centuries to be a marked distinction between the Scots and the Irish on the one hand, and the churches of England and the continent on the other. This was in reference to ecclesiastical government. The Scots recognized the same orders of the ministry, bishops, priests, and deacons, as other Christians did; and, like them, they held that ordination could be given only by bishops. But they acknowledged no such supremacy of jurisdiction in the episcopal order as was held by other churches. In Scotland, there were neither dioceses nor parishes; but there were numerous monasteries, in which the abbots, whether bishops or priests, bore the chief rule, all being in subordination to the successor of St. Columba, the presbyter-abbot of Iona, who, in virtue of that office, was primate of the Picts and Scots.

When Iona was desolated by the Northmen, the primacy seems to have been transferred in the middle of the 9th c. to the abbots of Dunkeld, and about fifty years afterward to the bishops of St. Andrews, who became known as *episcopi Scottorum*, the bishops of the Scots. Slowly at first, but gradually, an assimilation to the English and continental practices began, a change rendered more easy by the Scottish dominion being extended over Lothian, in which the ecclesiastical system was the same as that of England. A great impulse was given in the same direction by the marriage of Malcolm III., king of the Scots, with Margaret, the sister of Edgar Atheling. The king and queen used their utmost efforts to introduce the English usages in ecclesiastical as in other matters; and Margaret herself held repeated conferences for that purpose with the chief Scottish ecclesiastics, at which her husband acted as interpreter. The principal points in which she attempted to bring about a reform were the commencement of the Lent fast, the superstitious infrequency of receiving the communion, and the lax observance of Sunday and of the Scriptural and canonical restrictions on marriage between relations.

The reform begun by Malcolm and Margaret was fully carried out by their youngest son, David I. These improvements were completed by his successors, and before the end of the 12th c. the ecclesiastical system of Scotland differed in no important point from that of the rest of Europe. Some Scottish writers have lamented the change, as being one from purity of belief and practice to superstition and immorality. This is undoubtedly a mistake. The Celtic church had become very corrupt, and the clergy were inferior both in learning and morals to their brethren in the south. King David was a reformer in the best sense of the word, and it does not detract from the character of his reformation, that as time went on the Scottish church became involved in those superstitions with which the rest of Christendom was overspread.

The ritual of the Scottish mediæval church was almost the same as that of England, the Salisbury missal and breviary being the models of the liturgies and office books used in Scotland. The external system of the church—cathedral, parochial, and monastic—was also in almost every point identical. The chief monastic orders were the Benedictine, and most important branches the Cluniac and Cistercian, the canons regular of St. Augustine, and the reformed premonstratensian canons. The Cluniacs and Cistercians were in strict subordination to the mother-houses of their orders at Cluny and Cîteaux. In the 13th c. the Dominican, Franciscan, and Carmelite friars were introduced into Scotland. The chapters of all the Scottish cathedrals, except those of St. Andrews and Whithorn, were composed of secular canons—the chief dignitaries being a dean, archdeacon, chancellor, precentor, and treasurer. The prior and canons regular of the Augustinian monastery at St. Andrews formed the chapter of that see, and the prior and premonstratensian canons of Whithorn formed the chapter of the cathedral of Galloway. There were twelve dioceses in the Scottish church, to which Orkney was added on the transference of those islands to the Scottish sovereign in the 15th century. The twelve dioceses were Caithness, Ross, Moray, Aberdeen, Brechin, Dunkeld, Dunblane, St. Andrews, Argyle, the Isles, Glasgow, and Galloway. The larger of these dioceses were divided, like the English dioceses, into rural deaneries. The single point in which the mediæval church down to the 15th c. differed from that of England and other churches of the west, was in its having no metropolitan. St. Andrews, and next to it Glasgow, had a certain precedence; the bishops of the former see, and failing them the bishops of the latter, having the privilege of crowning and anointing the sovereign. But they had no jurisdiction over the other sees, nor did their bishops bear the style of archbishop. This led to claims on the part of the archbishops of York to metropolitan authority in Scotland, which had no foundation except in regard to the southern portion of the diocese of St. Andrews, and the see of Galloway, the bishops of which were for several centuries suffragans of York. The court of Rome found it convenient, for the sake of its own privileges, to encourage this anomalous system; but to provide for the meetings of the Scottish bishops in provincial council, a bull of pope Honorius III., in 1225, authorized them to meet in synod. In virtue of this bull, the bishops, abbots, priors, and other chief ecclesiastics, with representatives of the capitular, collegiate, and conventual bodies, assembled annually in provincial synod, sitting in one house, under the presidency of a conservator chosen by and from the bishops. The chief government of the church under the pope thus devolved on these synods, and their elective presidents. This continued until the erection of St. Andrews into an archiepiscopal and metropolitan see, in virtue of a bull of pope Sixtus IV., in 1472. By this bull all the Scottish sees were made suffragans to that of St. Andrews, whose bishops were now to be styled archbishops.

In 1492 Glasgow was raised to the dignity of a metropolitan see by a bull of pope Innocent VIII., and the bishops of Dunkeld, Dunblane, Galloway, and Argyle were made suffragans to its archbishop, an arrangement which was soon afterward altered to some extent—Dunkeld and Dunblane being re-annexed to St. Andrews, and Glasgow having for its suffragan sees those of Galloway, Argyle, and the Isles. This last arrangement continued until the reformation; and afterward, during the establishment of Episcopacy—the two Scottish archbishops occupying toward each other precisely the same position as the archbishops of Canterbury and York, and being sometimes

involved in the same unseemly broils, in regard to jurisdiction and precedence, which long existed between the English metropolitans.

Scotland shared in all the errors of belief and superstitious practices in worship to which the rest of Christendom was subjected, and the ignorance and immorality of the clergy were far worse than they were in England, or perhaps anywhere in Europe, except in the Scandinavian churches. The desire for reformation which led to the proceedings of Huss and Wickliffe, produced similar effects in the Scottish kingdom. As early as the year 1406 or 1407, James Resby, an English priest, and a disciple of Wickliffe, was burned at Perth; and in 1433 Paul Crawar, a German Hussite, was burned at St. Andrews. The opinions of Wickliffe continued to be privately taught, particularly in the s.w. counties, where his followers were known by the name of the Lollards of Kyle. In the following century, the intercourse with the continent was frequent and close, and the effects of Luther's preaching and writings were soon felt in Scotland. In the year 1525 the importation of Lutheran books, and the propagation of the reformers' tenets, were forbidden by an act of the Scottish parliament; and in February, 1528, Patrick Hamilton, abbot of Ferne, was burned at St. Andrews for teaching and publishing Lutheran doctrines. The piety of Hamilton, and the patience with which he bore his sufferings, induced others to follow his teaching and example. Several persons, both ecclesiastical and laymen, were subsequently burned, and many more fled to England and the continent.

The persecution, though encouraged or permitted by the bishops, was disapproved of by some ecclesiastics of learning and influence, who were desirous of effecting a reform in the church without breaking off from communion with the hierarchy. The efforts of this school were unsuccessful, and the Scottish nation was gradually divided into two parties—one of which, headed by the bishops, and supported by the state, was determined to resist all change; and the other, composed of a considerable number of the clergy both regular and secular, of the gentry, and of the burgesses of the large towns, was disposed to carry its reforming principles far beyond what had been done by Luther and by Melancthon. These two parties came into deadly conflict in 1546. On Feb. 28 in that year George Wishart, the most eloquent of the reforming preachers, was condemned to death by an ecclesiastical court—at which cardinal Beaton, archbishop of St. Andrews, presided—and was burned. On May 28 following, the cardinal was murdered by Norman Leslie and other adherents of the reforming party. The struggle continued during the regency of the earl of Arran and that of Mary of Lorraine, the mother of Mary, the young queen of Scots.

In the year 1559 the reformers became strong enough to set the regent at defiance. Various circumstances encouraged them to demand freedom for their opinions, particularly the death of Mary of England and the accession of Elizabeth. They were further animated at this time by the return from Geneva of their chief preacher, John Knox. The conflict was to be decided by other than spiritual weapons. The regent and the reformed, now known by the name of the Congregation, met in open warfare. The contest was carried on for a twelvemonth, and ended in the triumph of the Congregation. A parliament met at Edinburgh on Aug. 1, 1560. The reforming party had the complete ascendancy, and succeeded in passing several acts, by which the jurisdiction of the pope was abolished, the mass was proscribed, and a confession of faith, drawn up by Knox and his associates, was ratified, the spiritual lords making a faint resistance.

The new confession of faith adhered, in all essential articles of belief, to the ancient creeds of the church. In regard to the sacraments it differed entirely from the recent corrupt teaching of the western church; but its language, on the whole, was moderate and conciliatory. In reference to ceremonies and the details of church polity, it declared that such things were temporary in their nature, and not appointed for all times and places, and that they ought to be altered when they fostered superstition and ceased to be conducive to edification.

A book of discipline was soon afterward drawn up by the compilers of the confession, which was generally approved of, but did not receive the sanction of parliament. It followed out in detail the principles laid down in the confession. In regard to the office-bearers of the church various orders were mentioned, but three were specially of importance—ministers, elders, and deacons. Ministers were to be chosen by each several congregation, but were to be examined and admitted in public by the ministers and elders of the church. No other ceremony, such as imposition of hands, was to be used. The elders and deacons were to be chosen yearly in each congregation, and were not to receive any stipend, because their office was only to be from year to year, and because they were not to be debarred from attending to their own private occupations. In order to the better provision for the wants of the time, certain persons, called superintendents, were appointed in particular districts, with power to plant and erect churches, and to appoint ministers within the bounds of their jurisdiction.

The chief governing as well as legislative and judicial power in the reformed church was intrusted to a general assembly, which met half-yearly or yearly, and was composed of the superintendents, ministers, and lay commissioners, and which gradually, by the introduction of the system of representation, assumed the form and more than the power of a parliament.

The worship of the reformed church was modeled on that established by Calvin at

Geneva. It was embodied in a formulary called the book of common order, which for nearly a century continued to be generally used. It contained forms for the ordinary worship both on Sundays and week days, and for the administration of the sacraments, and for certain other occasions. The minister was not absolutely restricted to these forms. Except in the singing of psalms, the people took no direct part in ordinary worship, and there was no distinction of ecclesiastical seasons, all holidays whatever except Sunday being abolished.

The form of church government established at the reformation did not remain long undisturbed. Some of the most zealous Protestants thought the danger to which the church was exposed from state tyranny and aristocratical oppression could best be met by restoring the bishops to their ancient position both in the church and in the parliament; while others, of equal zeal and sincerity, saw in this only the commencement of a plan for bringing back all the errors of popery. A scheme of this kind was actually established for some time, and the sees were filled with Protestant bishops set apart for the office by their brethren of the ministry. It was almost immediately attacked by some of the ministers, who soon found a leader in Andrew Melville, a scholar of considerable eminence, who returned to Scotland in 1574, after a residence in Geneva, during which he had ardently embraced the new opinions as to ecclesiastical government maintained by Beza.

The struggle continued for some years, the bishops being encouraged by the sovereign and his advisers, whose support was frequently of little real advantage to them, and Melville receiving the zealous assistance of many of the ministers, and of the great body of the common people, who sympathized with him in his democratical theories of civil and ecclesiastical government. Melville was at last entirely successful. His opinions were embodied in what was called the second book of discipline, which received the formal sanction of the general assembly in 1581. This formulary differed very much from the first book. It laid down authoritatively those principles in regard to ecclesiastical authority which the English Puritans were vainly striving to establish in the southern kingdom, and was in reality an attempt to make the civil power subordinate to the ecclesiastical, even in matters secular. It recognized four orders of office-bearers in the church, the pastor, minister, or bishop, the doctor, the presbyter or elder, and the deacon. These were to be set apart by ordination, and the imposition of the hands of the eldership, but no one was to be intruded into any office contrary to the will of the congregation, or without the voice of the eldership. Four sorts of church courts, each rising above the other, were sanctioned; first, of particular congregations, one or more; second, of a province, or what was afterward called the provincial synod; third, of a whole nation; and fourth, of the universal church. What is generally regarded as the most essential feature of the Presbyterian system—the presbytery—was not yet introduced in its proper form, the lowest court being a combination of what were afterward known as the presbytery and the kirk-session. It was, however, introduced before the year 1592, when the privileges of general and provincial assemblies, presbyteries, and parochial sessions were ratified by parliament, though the book of discipline itself did not receive any formal sanction.

King James had agreed to the establishment of Presbyterianism, but personally, and as a sovereign, he disliked its discipline, and he soon endeavored to overthrow it. His accession to the crown of England enabled him to do this with more authority. He gradually obtained from the general assembly a recognition of the civil rights of the bishops, and this led to the restoration of their ecclesiastical privileges. His changes were sanctioned by a general assembly which met at Glasgow in 1610, and in the course of the same year Episcopacy was restored in reality, as well as in name, by the consecration of three Scottish prelates, by four of the English bishops, at London.

The king wished to assimilate the Scottish church, as far as possible, to that of England, and his next important movement was the establishment of what are called the Five Articles of Perth. See PERTH, THE FIVE ARTICLES OF.

These various changes excited great dissatisfaction in Scotland, particularly in the southern counties, but it gradually abated to a considerable extent, and might have altogether ceased, had not further innovations been attempted. It was the wish of James to introduce a prayer-book like that of the English church, in place of the book of Common Order, but he saw the danger with which the proposal was attended, and gave it up or postponed it. His son Charles was as inferior to his father in prudence, as he excelled him in conscientiousness and religious zeal. During his first visit to Scotland he added another bishopric—that of Edinburgh—to the dioceses of the Scottish church. Most unwisely, and most improperly, he endeavored by his royal authority to introduce into that church a book of canons and a liturgy framed on the model of those of England. The king had many loyal supporters in all parts of Scotland, and in the n. Episcopacy was preferred by the people to Presbyterianism. But the storm of popular indignation which was now roused swept everything before it. The king's opponents banded themselves together by the national covenant, and at a general assembly held at Glasgow abolished the Perth articles and Episcopacy, and re-established Presbyterianism. Charles attempted to maintain his claim by the sword, but was unsuccessful, and obliged to ratify in parliament all that had been done by his opponents.

Had the covenanters been satisfied with the victory which they had won, Presby-

terianism might have remained the established religion of the Scottish kingdom. But they could not resist the entreaties for aid from the English Puritans, or rather they yielded to the delusion of extending their own discipline over the churches of England and Ireland. They just attempted, in an opposite direction, what James and Charles had failed to accomplish. For a time their policy seemed to triumph. The solemn league and covenant of the three kingdoms, after having been approved by the general assembly in Scotland, was signed by the assembly of divines which the parliament had summoned to meet at Westminster, and by the parliament itself. The ecclesiastical documents which were afterward drawn up originated with the assembly of divines, but were sanctioned by the assembly in Scotland. The principal of these were a directory for public worship, a confession of faith, and a larger and shorter catechism. See **ASSEMBLY OF DIVINES, and CREEDS AND CONFESSIONS.** The first of these documents was intended to supersede the book of Common Prayer in England, and, indirectly, the book of Common Order in Scotland. It laid down certain general rules in regard to public worship and the administration of the sacraments, but left very much to the discretion of the particular ministers and congregations.

The union between the Scottish and English Puritans was dissolved by the ascendancy of the independents. Scotland, distracted by civil and ecclesiastical dissension, was unable to defend itself against Cromwell. It was conquered and kept thoroughly under subjection by the English army, which forbade the meetings of the general assembly, but left the other courts and the rest of the church system as they were before. At the restoration, the higher classes generally, who had suffered under the ecclesiastical tyranny of the ministers, were zealous for the re-establishment of Episcopacy. The greater part of the nation, except in the south-western provinces, was indifferent, and the king experienced no difficulty in restoring the bishops to their former rights both in church and state. But Episcopacy alone was restored; there was no attempt to introduce a liturgy, or even to enforce the observance of the Perth articles. The new primate, archbishop Sharp, was an able man, of good moral character, but ambitious and overbearing, and the covenanters never forgave his change from Presbyterianism, though he had always belonged to the more moderate of the two parties into which the church was divided. He was almost the only one of the bishops who enjoyed political influence; and, unfortunately for himself and the hierarchy, that influence was generally used to encourage, not to restrain, the severe measures of the government. When the primate was assassinated, that severity became a cruel tyranny, and many who had no predilection for any particular ecclesiastical opinions were ready to welcome the change which took place at the revolution.

When the Scottish estates met in 1689, to consider what course was to be adopted in the northern kingdom, the bishops declined to abandon king James. Whatever might have been the consequences had they taken an opposite course, this resolution was fatal to the Episcopal establishment. William and Mary were called to the throne, and prelacy was declared to be an insupportable grievance, and was abolished. In the following year Presbyterianism was re-established, and the Westminster Confession of Faith was ratified as the national standard of belief, and the right of patrons to nominate to ecclesiastical benefices was taken away. In the end of the same year a general assembly was held, the first which had been allowed to meet since its dissolution by the order of Cromwell. It was composed, as before, of ministers and elders from the various presbyteries, and of elders from the burghs and universities, and was presided over by a lay commissioner, named by the crown, and a minister elected by the members as moderator. With the exception of some years in the reign of William, the assembly has continued to meet annually since the revolution, and to transact business during the periods when it was not in session by a commission named by itself for the purpose. See **ASSEMBLY, GENERAL.** The other chief ecclesiastical events of William's reign were a series of vain attempts on the part of the sovereign to bring about a comprehension of the Episcopal clergy with those of the establishment, and the passing by the assembly in 1697 of what was called the "barrier act," which guarded against sudden legislation, by providing that no permanent act should be passed until it had received the approbation of the majority of the presbyteries.

During the reign of queen Anne, and in the year 1707, England and Scotland were united into one kingdom. A special statute was passed for the security of the Protestant religion and Presbyterian church government in the latter country; providing that these should continue without any alteration in time to come, and confirming the act of William and Mary, which ratified the confession of faith, and settled the Presbyterian form of church government.

In the year 1712, an act was passed by the British parliament which restored to patrons in Scotland their right of presentation to benefices. This statute excited great discontent among the members of the Established church, and for many years attempts were made to obtain a repeal of it. These attempts were unsuccessful, but its provisions were long practically disregarded. When at length the general assembly began to act upon it, the dissatisfaction increased among those who held the divine right of the people to choose their own ministers. The leader of the discontented party was a minister named Ebenezer Erskine, and he with his adherents, in the year 1733, finally separated from the Establishment, and formed a communion which took the title of the Associate

Presbytery, though its members were popularly known as the Seceders. The Seceders themselves were soon divided by a very absurd dispute into two bodies, called the Burgher and the Antiburgher Synods. In the year 1761, another secession from the Establishment took place in connection with the law of patronage; and the separated body assumed the name of the Presbytery of Relief.

There were no further secessions from the church; but its members were divided into two parties, known as the moderates and the evangelicals (q.v.), the former of whom were favorable, the latter hostile to the law of patronage. For many years the Moderates, headed by Dr. Robertson the historian and others of his school, and supported by the influence of the government, maintained an ascendancy in the general assembly and throughout the country. In the latter years of George III., and during the reign of George IV., this ascendancy began to decrease. The political excitement which prevailed in the beginning of the reign of William IV. strongly affected the Scottish Establishment, which from its very constitution is peculiarly liable to be moved by the impulses of popular feeling. The two parties in the general assembly engaged in a struggle more fierce than any in which they had yet met; and the subject of dispute, as before, was immediately connected with the law of patronage. Dr. Chalmers, the most distinguished minister in Scotland, added the whole weight of his influence to the popular party, and in 1834 an interim act of assembly was passed, known as the Veto act, which declared it to be a fundamental law of the church that no pastor should be intruded on any congregation contrary to the will of the people, and laid down certain rules for carrying out this principle. The legality of this act was doubted; and in connection with a presentation to the parish of Auchterarder, the presentee, on being rejected by the presbytery in terms of the Veto act, appealed, with concurrence of the patron, to the court of session—the supreme civil court in Scotland. That court decided that the conduct of the presbytery in rejecting the presentee was illegal, and their judgment was affirmed by the house of lords. Other cases of a similar nature followed, and something like a conflict took place between the civil and ecclesiastical courts, the former enforcing their sentences by civil penalties, the latter suspending and deposing the ministers who obeyed the injunctions of the court of session. In the general assembly of 1843 the dispute came to a crisis. A large number of ministers and elders of the popular party left the assembly, and met apart in a similar body, of which Dr. Chalmers was chosen moderator. They formed themselves into a separate communion under the title of "The Free Church of Scotland," and gave up their benefices in the Established church, and all connection whatever with that body. The Free church carried off about one-half of the members of the Establishment, and became a rival communion in most of the parishes. See FREE CHURCH. By an act of parliament in 1874, patronage was abolished in the Established Church and the right of choosing the minister transferred to the congregation. See PATRONAGE.

In 1820 the Burgher and Antiburgher Seceders were united under the name of the Associate Synod of the Secession church; and in 1847 this associate synod and the relief synod were united under the name of "The United Presbyterian Church," (q.v.). The recent negotiations for a union of the United Presbyterian church and the Free church have led to no practical result.

A few remarks may be added on the history of Scottish episcopacy subsequently to the revolution. It is a common but erroneous opinion that almost all the Episcopal clergy were Jacobites from the time of the accession of William and Mary. The bishops were so; but a large number, probably a considerable majority of the clergy, had at first no objection to take the oath of allegiance to the new government. During the reign of queen Anne, the Episcopal clergy were well disposed to the government, knowing the queen's good wishes to their communion. They were frequently harassed by the courts of the Establishment; but all who were willing to take the oaths obtained an ample protection for their worship on the passing of the Toleration act of 1712. On the death of the queen, almost all the clergy, and most of the laity, were involved directly or indirectly in the attempts to overthrow the Hanoverian dynasty, and it was this which finally made the names of Episcopalian and Jacobite for many years to be convertible terms.

In the meantime, the succession of bishops had been kept up by new consecrations, and after some years the dioceses, though diminished in number, were regularly filled. An important change took place in the forms of worship. No longer trammelled by their connection with the state, they adopted liturgical forms similar to those in the English prayer-book, and in almost all cases identical, except that many of the congregations used an office for the communion modeled on that of the Scottish liturgy of King Charles I. The Episcopalians took no such open part in the insurrection of 1745 as they did in that of 1715, but their sympathies were known to be with the house of Stewart; and the government carried through parliament some intolerant acts, which were put in execution with great harshness, and which for many years suppressed all public worship in the Episcopal communion. It was only after the accession of George III. that these statutes ceased to be actively enforced; and it was not till 1792 that the Episcopalians, who from the death of prince Charles had acknowledged the reigning dynasty, were relieved from the penal laws. The act which gave this relief imposed restrictions on their clergy officiating in England, and prohibited their holding benefices

in the English church. In 1804, the bishops and clergy agreed to adopt the thirty-nine articles of the church of England, and in 1863, the prayer-book was adopted as the authorized service-book of the Episcopal church, permission being given in certain cases to use the Scottish communion office. The restrictions imposed on the Scottish clergy by the act of 1792 were modified by an act passed in 1840; and in 1864 they were entirely removed, the right being reserved to bishops in England and Ireland to refuse institution to a Scottish clergyman without assigning any reason, on his first presentation to a benefice in England or Ireland, but not after he should have once held such benefice.

The dioceses of the Scottish Episcopal church are seven in number, viz., Moray, Aberdeen, Brechin, Argyle, St. Andrews, Edinburgh, and Glasgow. The bishops are chosen by the clergy of the diocese, and by representatives of the lay communicants, a majority of both orders being necessary to a valid election. One of the bishops, under the name of primus, chosen by the other bishops, presides at all meetings of the bishops, and has certain other privileges, but possesses no metropolitan authority. The highest judicial body is the episcopal college, composed of all the bishops. The highest legislative body is a general synod, composed of two houses, the one of the bishops, the other of the deans and the representatives of the clergy.

The chief original authorities for the ecclesiastical history of Scotland down to the revolution are the same as those mentioned in the article on the civil history. The chief modern authorities are : Cook's *History of the Reformation* and *History of the Church of Scotland*; Cunningham's *Church History of Scotland*; Grub's *Ecclesiastical History of Scotland*.

SCOTLAND, ROYAL ARMS OF. The arms of Scotland are—Or, a lion rampant gules, armed and langued azure, within a double tressure flory counterflory of fleur-de-lis of the second. Supporters—Two unicorns argent armed maned and unguled or, gorged with open crowns, with chains affixed thereto, and reflexed over the back of the last.

Crest—A lion sejant affronté gules crowned or, holding in the dexter paw a sword, and in the sinister a scepter, both erect proper.

The lion is first seen on the seal of Alexander II., and the tressure on that of Alexander III. The unicorn supporters do not appear on any of the royal seals of Scotland till the time of queen Mary, on whose first great seal (1550) they are represented as chained and gorged with crowns. They were, however, sculptured on Melrose abbey as early as 1505.

In 1603, in consequence of the union of the crowns of England and Scotland, the Scottish arms came to be quartered with those of England and Ireland, while one of the English lions was adopted as a supporter. Precedence was, however, given within



Royal Arms of Scotland, previous to the Union.

Scotland to the Scottish ensigns, which occupied the first and fourth quarters, and the unicorn also obtained the place of honor, being dexter supporter. From about the time of Charles I. to 1707, it became the practice to represent the unicorn as not merely gorged with an open crown, but crowned with an imperial crown. The treaty of union of 1707 declared (art. 1) that the ensigns of the United Kingdom should be in future such as her majesty should appoint "on all flags, banners, standards, and ensigns, both on sea and land;" the same mode of marshaling being adopted in England and Scotland. But art. 24 has been sometimes supposed to leave room for a different mode of marshaling on the seals in use in matters relating exclusively to Scotland, and on the great and other seals of Scotland. Since, as well as before the union, precedence has been given to Scotland. The question of the proper marshaling of the royal arms within Scotland was raised in 1853 by a petition to the queen by the magistrates of Brechin; a

reference was made by the home office in the first instance to Garter king-at-arms, and Garter's report was transmitted to the office of the lord Lyon, where it was returned with observations by the Lyon depute, who considered Scotland entitled to precedence on the judicial seals of the country ; and his views have since continued to be acted on.

SCOTLAND YARD is at the south-eastern corner of Charing Cross, London, just east of the Banqueting-house. At the present time it is famous as the headquarters of the Metropolitan Police Force, and the immediate locality is a labyrinth of alleys and passage-ways bounded by stables, sheds, temporary offices, etc. In one corner is a building known as the *Black Museum*, in which is a curious collection of stolen goods and all sorts of tools and implements that have been taken from criminals at the time of their arrest. It derives its name from having been the site of a palace set aside as a residence for the Scottish kings whenever they should desire to visit London.

SCOTT, a co. in w. Arkansas, having a ridge of the Ozark mountains for its s. boundary ; 930 sq.m.; pop. '90, 12,635, chiefly of American birth, with colored. It is drained by the Fourche La Pave and other small streams. The surface is mountainous except in the central portion where the river runs. It is nearly equally divided into prairie and woodland, forests of yellow pine and other building timber alternating with groves of tropical trees. Its soil is fertile, producing grain and providing excellent pasturage. Co. seat, Waldron.

SCOTT, a co. in w. Illinois, bounded on the w. by the Illinois river, watered by Sandy and Movestar creeks, traversed by the Chicago, Burlington, and Quincy, and the Wabash railroads; about 250 sq. m.; pop. '90, 10,304, chiefly of American birth. The surface is level and well wooded. The soil is fertile. The principal productions are corn, wheat, oats, rye, and livestock. Bituminous coal is found. There are saw-mills, manufactories of earthenware, of carriages, etc. Co. seat, Winchester.

SCOTT, a co. in s. Indiana, drained by Graham's fork; on the Baltimore and Ohio Southwestern, and the Pittsburg, Cincinnati, Chicago, and St. Louis railroads; about 190 sq. m.; pop. '90, 7833, chiefly of American birth. The surface is level and heavily timbered. The soil is fertile. The principal productions are corn and pork. Co. seat, Scottsburg.

SCOTT, a co. in e. Iowa, adjoining Illinois; drained by the Mississippi and the Wapispicon rivers; on the Chicago, Rock Island, and Pacific, the Chicago, Milwaukee, and St. Paul, and other railroads; about 440 sq. m.; pop. '90, 43,164, chiefly of American birth. The surface is rolling. The soil is fertile. The principal productions are wheat, corn, barley, and cattle. Bituminous coal is found. Co. seat, Davenport.

SCOTT, a co. in w. Kansas, drained by branches of Walnut creek and of Smoky Hill river; area, 720 sq. m.; pop. '90, 1262, chiefly of American birth; on the Atchison, Topeka, and Santa Fé and the Missouri Pacific railroads. Co. seat, Scott.

SCOTT, a co. in n. Kentucky, intersected by the Cincinnati, New Orleans, and Texas Pacific, the Kentucky Midland, the Queen and Crescent line, and the Southern railroads; 272 sq. m.; pop. '90, 16,546, chiefly of American birth, includ. colored. It is drained by the North and South forks of Elkhorn creeks and branches of the Kentucky river. Its surface is uneven. Its soil produces grain, tobacco, and sorghum, and is adapted to stock raising and dairy products. It has an under stratum of blue Silurian limestone. Co. seat, Georgetown.

SCOTT, a co. in s.e. central Minnesota; bounded on the n. and n.w. by the Minnesota river; on the Chicago, Milwaukee, and St. Paul, and the Chicago, St. Paul, Minneapolis, and Omaha railroads; about 355 sq. m.; pop. '90, 13,831, chiefly of American birth. The surface is rolling. The soil is fertile. The principal productions are corn, wheat, and cattle. Co. seat, Shakopee.

SCOTT, a co. in central Mississippi, intersected by the Queen and Crescent route railroad; 600 sq.m.; pop. '90, 11,740, chiefly of American birth, includ. colored. It is drained by Strong and Long Warrior rivers, tributaries of the Pearl. Its surface is uneven, a large proportion covered with timber and thick groves of tulip trees, magnolia, etc. Its soil is a sandy loam, producing cotton and grain ; and live stock is raised. Co. seat, Forest.

SCOTT, a co. in s.e. Missouri ; adjoining Illinois, bounded on the e. by the Mississippi river ; on the St. Louis, Iron Mountain, and Southern railroad ; about 434 sq.m.; pop. '90, 11,228, chiefly of American birth. The surface is uneven and heavily timbered. The soil is moderately fertile. The principal productions are corn and wheat. Co. seat, Benton.

SCOTT, a co. in e. Tennessee, having the state line of Kentucky for its n. boundary ; 620 sq.m.; pop. '90, 9794, chiefly of American birth, with colored. It is drained by the Big South fork of the Cumberland river, Little White Oak creek, and New rivers. Its surface is mountainous. Co. seat, Huntsville.

SCOTT, a co. in s.w. Virginia, having the state line of Tennessee for its s. boundary, 528 sq.m.; pop. '90, 21,694, chiefly of American birth, with colored. It is drained by Clinch river, Copper creek, and other streams. Co. seat, Gate City.

SCOTT, AUSTIN, PH.D., was born in Ohio in 1850, was graduated from Yale College, and then studied at the University of Michigan and at Berlin and Leipsic. From 1873 to 1875 he was instructor in German at the Michigan University, and from 1875 to 1881 was engaged in arranging materials for Bancroft's *History of the Constitution*. He was associate in history at Johns Hopkins, and organized there the Seminary of American History. In 1883 he was elected professor of history, political economy, and constitutional law at Rutgers College, N. J., of which institution he became president in 1890, on the resignation of Dr. Merrill E. Gates. He published *New Jersey in the American Commonwealth Series* (1891).

SCOTT, CHARLES, 1733-1813; b. Va.; on the field as a non-commissioned officer at Braddock's defeat, 1755; capt. of the first company in the revolutionary war which was raised s. of the James. He served with distinction at Trenton; brig. gen., 1777. He was with Wayne at Stony Point, 1779; prisoner at Charleston, S.C., 1780. At Monmouth he was the last on the battle field. In 1785 he removed to Kentucky. He shared the defeat of St. Clair in 1791, had charge of a successful expedition to the Wabash, and took part in the war with the Indians, 1791. In 1794 he was in command under Wayne at the battle of Fallen Timbers. He was governor of Kentucky, 1808-12. A co. and a town in Kentucky were named in his honor.

SCOTT, CLEMENT, son of the Rev. William Scott, a well-known literary man, was born in London, Oct. 6, 1841, and was educated at Marlborough College, Wiltshire. He entered the War Office as clerk in 1860, and retired on a pension in 1877. He then joined the editorial staff of the *Daily Telegraph*, to which paper he had contributed dramatic criticisms since 1872. He is the author of *Lays of a Londoner* and *Poems for Recitation*, both books of dramatic poems; *Round about the Islands* and *Poppy Land Papers*, *Pictures of the World* (1894), and is also a constant contributor to the *Illustrated London News*. He is likewise author, or part author, of the following plays: *Diplomacy*, *The Vicarage*, *Off the Line*, *The Cape Mail*, *Peril*, *The Crimson Cross*, *Odette*, *Tears*, *Idle Tears*, and *Sister Mary*, and has been editor of the *Theatre* magazine since 1880.

SCOTT, DAVID, a remarkable Scottish painter, was born in Edinburgh, Oct. 10, or 12, 1806. He may be said to have commenced his career as an artist by an apprenticeship to his father, who was a landscape engraver; but endowed as he was with a deep, stern, somber genius, it was soon visible to all who knew him that he was meant to be a painter. The first production that he ventured to send to the British institution, "Lot and his Daughters Fleeing from the Cities of the Plain," was returned as too large; but Scott was too "imperiously original" to take advice, and went on courageously painting pictures which, it has been said, "would have required a hall for their exhibition, and which the public would neither admire nor buy." In 1831 he exhibited the "Monograms of Man," a series of singularly suggestive sketches; and the first of his illustrations to Coleridge's *Ancient Mariner*, which are almost equal to the poem itself in weird and vivid beauty. In 1832, among others, "Sarpedon carried by Sleep and Death," a very fine work. In the autumn of the same year he set out for Rome, visiting most of the famous artistic cities on his way. Nothing, however, that he saw in Italy or France materially affected the bent of his genius, and his picture of "Discord, or the Household Gods Destroyed," painted there, exhibits all the peculiarities of his style and thought in a rampant and even repellent manner. In 1834 he returned to Edinburgh, and resumed his solitary brush. Passing over several interesting works, we may specially mention, as belonging to the year 1838, "Ariel and Caliban," and the "Alchymist," two of his best efforts in point of execution. Between 1840 and 1843 his chief productions were "Philoctetes," "Queen Elizabeth in the Globe Theater," "The Duke of Gloucester taken into the Water-gate of Calais," "Silenus praising Wine," "Richard III.;" his illustrations (40 in number) of *The Pilgrim's Progress*, in which, as in those of *The Ancient Mariner*, he rivals the genius of the author he illustrates. In 1847 he produced the masterpiece of his whole career, "Vasco da Gama Encountering the Spirit of the Cape." But Scott, always delicate, and even drooping in health, had now exhausted himself, and on March 5, 1849, he died, when fame was only beginning to encircle his name.

SCOTT, Sir GEORGE GILBERT, 1811-78; grandson of the Rev. Thomas Scott, the biblical commentator, b. Buckinghamshire; studied architecture, and was employed in restoring many of the old English cathedrals, including Westminster abbey, and in building churches, secular edifices, and colleges, and the Albert Memorial.

SCOTT, JOHN MORIN, 1730-84; descendant of the baronial Scotts of Ancram; b. New York; graduated at Yale college, 1746; studied law and married Helena Rutgers; was a determined opposer of colonial oppression, and because of his advanced sentiments failed of election to congress, 1774; was an active member of the general committee for New York, and of the provincial congress, 1775; appointed a brig. gen., 1776; and with his brigade, was in the battle of Long Island; secretary of the state of New York, 1777-79, and a member of congress, 1780-83.

SCOTT, Sir MICHAEL, a mediæval scholar and philosopher of the 13th c., whose real history is not only obscure but positively unknown. Boece identifies him with a Michael Scott of Balweary, in the parish of Kirkcaldy, in Fifeshire, who, along with sir Michael de Wemyss, was sent to Norway in 1290, by the Scottish estates, to bring home the "Maiden of Norway," and his death is fixed in the following year. But sir Robert Sibbald, in his *History of Fife and Kinross* (published in the reign of Charles II.), speaks

of a certain indenture, dated 1294, to which Scott's name was affixed, and in another part of the same book states that he went on a second embassy to Norway in 1310, to demand the cession of the Orkneys. If we may rely on sir Robert's statement, it is hardly possible that the Scotch "wizard" of European renown could have been the same person as Michael Scott of Balweary, because (as the story goes) after studying at Oxford or Paris, he went to the court of Frederic II., and wrote there some books at the request of that monarch. Now Frederic died in 1250, and supposing "the wizard" not more than 30 years old at that time, this would make him 70 when he went to Norway the first time to bring home the "Maiden," and 90 on his second visit to demand the cession of the Orkneys, neither of which things is likely. Hector Boece, it should be observed, is our sole authority for the identification of Michael Scott of Balweary with the wizard, while, on the other hand, Dempster, in his *Historia Ecclesiastica Gentis Scotorum* (Bologna, 1627), distinctly avers that the name *Scotus*, borne by the latter, was that of his nation and not of his family—Michael, "the Scot." It has been suggested that the ambassador may have been the son of the wizard, and that Boece may have confounded the two—a supposition probable enough in itself, but for which, in the absence of evidence, nothing can be said. The legend is further complicated by the fact that it appears to be English as well as Scottish. Cumberland claims the magic hero for herself. Camden, in his *Britannia* (1586), asserts that he was a monk of Ulme or Holme Cultram in that country, about 1290, "who applied himself so closely to the mathematics, and other abstract parts of learning, that he was generally looked on as a conjurer; and a vain credulous humor has handed down I know not what miracles done by him." He likewise states that Scott's "magic books" were preserved there, but adds that they were then moldering into dust; and Satchells (see his rhyming *History of the Right Honorable Name of Scott*) declares that he examined a huge tome which was held to be the wizard's, at Burgh-under-Bowness in 1629. According to the Scottish legend, he was buried in the abbey of Melrose, and the border was the scene of many of his most wonderful exploits, such as the cleaving of the Eildon hills into three separate cones, and his bridling of the river Tweed! Dante mentions him in his *Inferno* (some years before 1321), in a way that shows that already his fame as a magician had spread over the continent, and suggests the suspicion that he must have died sooner than is commonly believed. All, however, that any one who rationally looks at the legend can believe is that a certain Michael Scott, or Michael the Scot, flourished in the 13th c., and was mistaken by the common people of his country for a wizard or magician, probably on account of his skill as an experimentalist in natural philosophy. The writings attributed to him indicate that his studies lay in this direction.

SCOTT, ROBERT, D.D., b. England, 1811; graduated at Christ Church college, Oxford, in 1831; became a fellow and tutor; ordained and became rector of several parishes; was master of Balliol in 1854; professor of exegesis in 1861; dean of Rochester in 1870. He prepared with dean Liddell a *Greek Lexicon*, translated several works of the fathers, and was one of the English committee appointed to revise the New Testament. He d. 1887.

SCOTT, THOMAS, D.D., 1747-1821; b. England; ordained in 1773; became curate in Buckinghamshire; succeeded John Newton, curate of Olney, in 1780; was chaplain to the Lock hospital in 1785; rector of Aston Sandford in 1803. He published *Commentary on the Bible*, 6 vols.; *Defense of Calvinism*, against bishop Tomline; *Force of Truth*, which has been often reprinted; *Scriptural Doctrine of Civil Government and the Duties of Subjects*; *The Rights of God*; *Vindication of the Holy Scriptures*; *Signs of the Times*; *The Articles of the Synod of Dort*; *The Jews*. His commentary on the Bible, now little read, had immense circulation and influence in its day. Devoid of critical learning, it was strong in practical moral observations drawn from the text.

SCOTT, THOMAS A., 1824-81; b. Penn.; received a common-school education, and in 1844 became a clerk in the office of the collector at Columbia, Penn., where he remained until 1847, being then transferred to the collector's office in Philadelphia. He left this office in 1850 to take a position in the Pennsylvania railroad service, and in two years was appointed superintendent of the western division, and in 1858 made general superintendent of the road. This rapid advancement was concluded by his appointment in 1860 to the vice-presidency, and shortly afterward to the position of president, which he continued to hold until 1880, when ill-health forced his retirement. In 1861 President Lincoln appointed Mr. Scott assistant secretary of war, in which position it fell to his duty to supervise and organize the system of transportation for the northern armies, a most arduous and complicated task, which he accomplished with remarkable accuracy and completeness.

SCOTT, SIR WALTER, the fourth child of Walter Scott, writer to the signet in Edinburgh, was born in that city on Aug. 15, 1771. He came of the old border family, the Scotts of Harden, an offshoot from the house of Buccleuch. Though he matured into a man of robust health, and of strength nearly herculean, as a child he was feeble and sickly, and very early he was smitten with a lameness which remained with him through life. His childhood was passed for the most part at Sandyknowe, the farm of his grandfather, in Roxburghshire. Here the foundations of his mind were laid; and his early and delighted familiarity with the ballads and legends then floating over all that part of the

country, probably did more than any other influence to determine the sphere and modes of his future literary activity. Between the years 1779 and 1783 he attended the high school of Edinburgh, where despite occasional flashes of talent, he shone considerably more on the play-ground as a bold, high-spirited, and indomitable little fellow, with an odd turn for story-telling, than he did within as a student. In 1783 he went to the university, and for three years he remained there, as it seemed, not greatly to his advantage. Afterward, in the height of his fame, he was wont to speak with deep regret of his neglect of his early opportunities. But though leaving college but scantily furnished with the knowledge formally taught there, in a desultory way of his own he had been hiving up stores of valuable though unassorted information. From his earliest childhood onward he was a ravenous and insatiable reader; his memory was of extraordinary range and tenacity, and of what he either read or observed he seems to have forgotten almost nothing. Of Latin he knew little, of Greek, less; but a serviceable, if somewhat inexact knowledge of French, Italian, Spanish, and German he had acquired, and he continued to retain. On the whole, for his special purposes, his education was perhaps as available as if he had been the pride of all his preceptors. In 1786 he was articled apprentice to his father, in whose office he worked as a clerk till 1792, in which year he was called to the bar. In his profession he had fair success, and in 1797 he was married to Charlotte Margaret Carpenter, a lady of French birth and parentage. Toward the end of 1799, through the interest of his friends lord Melville and the duke of Buccleuch, he was made sheriff-depute of Selkirkshire, an appointment which brought him £300 a year, with not very much to do for it. Meantime, in a tentative and intermittent way, his leisure had been occupied with literature, which more and more distinctly announced itself as the main business of his life. His first publication, a translation of Bürger's ballads, *Lenore* and *The Wild Huntsman*, was issued in 1796. In 1799 appeared his translation of Goethe's drama of *Goetz von Berlichingen*; and in the year following he wrote the fine ballads, *Glenfinlas*, the *Ere of St. John*, and the *Grey Brother*. The year 1802 gave to the world the first two volumes of his *Border Minstrelsy*, which were followed in 1803 by a third and final one. This work, the fruit of those "raids"—as he called them—over the border counties, in which he had been wont to spend his vacations, was most favorably received by the public, and at once won for him a prominent place among the literary men of the time. In 1804 he issued an edition of the old poem *Sir Tristram*, admirably edited and elucidated by valuable dissertations. Meantime *The Lay of the Last Minstrel* had been in progress, and by its publication in 1805 Scott became at a bound the most popular author of his day. During the next ten years, besides a mass of miscellaneous work, the most important items of which were elaborate editions of Dryden (1808) and of Swift (1814), including in either case a *Life*, he gave to the world the poems *Marmion* (1808); *The Lady of the Lake* (1810); *The Vision of Don Roderick* (1811); *Rokeby* (1813); *The Bridal of Triermain*, anonymously published (1813); *The Lord of the Isles* (1814); and *The Field of Waterloo* (1815). The enthusiasm with which the earlier of these works were received somewhat began to abate as the series proceeded. The charm of novelty was no longer felt; moreover, a distinct deterioration in quality is not in the later poems to be denied; and in the bold outburst of Byron, with his deeper vein of sentiment and concentrated energy of passion, a formidable rival had appeared. All this Scott distinctly noted, and after what he felt as the comparative failure of *The Lord of the Isles* in 1815, with the trivial exception of the anonymous piece *Harold the Dauntless* (1817), he published no more poetry. But already in *Waverley*, which appeared without his name in 1814, he had achieved the first of a new and more splendid series of triumphs. *Guy Mannering*; *The Antiquary*; *Old Mortality*; *The Black Dwarf*; *Rob Roy*; and *The Heart of Midlothian* rapidly followed, and the "Great Unknown," as he was called (whom yet every one could very well guess to be no other than Walter Scott), became the idol of the hour. The rest of the famous series, known as the *Waverley* novels, it would be idle to mention in detail. From this time onward, for some years, Scott stood on such a pinnacle of fame and brilliant social prosperity as no other British man of letters has ever gone near to reach. He resided chiefly at Abbotsford, the "romance in stone" he had built himself in the border country which he loved, and thither, as "pilgrims of his genius," summer after summer repaired crowds of the noble and the distinguished, to partake the princely hospitalities of a man whom they found as delightful in the easy intercourse of his home, as before they had found him in his writings. In 1820, to set a seal upon all this distinction, a baronetcy was bestowed upon him as a special mark of the royal favor. But the stately fabric of his fortunes, secure as it seemed, was in secret built upon the shifting sands of commercial speculation, and in the disastrous crisis of the year 1826 a huge ruin smote it. In 1805 Scott's income, as calculated by his biographer, was something nigh £1000 a year, irrespective of what literature might bring him; a handsome competency, shortly by his appointment to a clerkship of the court of session, to have an increment at first of £800, subsequently of £1300. But what was ample for all prosaic needs, seemed poor to his imagination with its fond and glittering dreams. Already some such vision, as at Abbotsford was afterward realized, flitted before his mind's eye, and it was the darling ambition of his heart to re-create and leave behind him, in the founding of a family, some image of the olden glories which were the life of his literary inspirations. In the year above mentioned, lured by the prospect of profit, and without the knowledge of his friends, he joined James Ballantyne, an old schoolfellow, in the establishment of a large printing business in

Edinburgh. To this, a few years afterward, a publishing business was added, under the nominal conduct of John Ballantyne, a brother of James; Scott, in the new adventure, becoming as before a partner; Gradually the affairs of the two firms became complicated with those of the great house of Constable & Co., in the sudden collapse of which Scott found himself one forenoon a bankrupt, with personal liabilities to the extent of something like £150,000.

"In the reproof of chance
Lies the true proof of men"—

and now, in this challenge of adverse fate, Scott's manhood and proud integrity were most nobly approved. With his creditors, composition would have been easy; but this usual course he disdained. "God granting him time and health," he said, he would owe no man a penny. And somewhat declined as he now was from the first vigor and elasticity of his strength, he set himself by the labor of his pen to liquidate this enormous debt.

Breaking up his establishment at Abbotsford, where the wife whom he loved lay dying, he hired a lodging in Edinburgh, and there for some years, with stern and unfaltering resolution, he toiled at his prodigious task. The stream of novels flowed as formerly; a *History of Napoleon*, in eight volumes, was undertaken and completed, with much other miscellaneous work; and within the space of two years, Scott had realized for his creditors the amazing sum of nearly £40,000. A new and annotated edition of the novels was issued with immense success, and there seemed every prospect that, within a reasonable period, Scott might again front the world, as he had pledged himself to do, not owing to any man a penny. In this hope he toiled on; but the limits of endurance had been reached, and the springs of the outworn brain broke in that stress of cruel and long-continued effort. In 1830 he was smitten down with paralysis, from which he never thoroughly rallied. It was hoped that the climate of Italy might benefit him; and by the government of the day a frigate was placed at his disposal in which to proceed thither. But in Italy he pined for the home to which he returned only to die. At Abbotsford, on Sept. 21, 1832, he died, with his children round him, and the murmur of the Tweed in his ears. On the 26th he was buried beside his wife in the old abbey of Dryburgh.

In estimate of Scott as an author, a few words must suffice. As regards his poetry, there is now little difference of opinion. Its merits, if somewhat superficial, are very genuine, and continue to secure for it some portion of the popular favor with which it was at first received. Deficient in certain of the higher and deeper qualities, and in those refinements of finish which we are of late accustomed to exact, it is admirable in its frank abandon, in its boldness and breadth of effect, its succession of clear pictures, its careless, rapid, easy narrative, unfailing life, spirit, vigorous and fiery movement. As a lyrist, Scott specially excelled; and scattered hither and thither in his works are to be found little snatches of ballad and song scarcely surpassed in the language. The rank of Scott as a writer of prose fiction it is not so easy to fix with anything like precision. So imposing to the mind is his immense prestige as a novelist, that even at this date it is difficult to criticize him coolly; but it is not without risk of awakening some undermurmur of dissent, that the absolute supremacy can now be assigned him which at one time, almost without question, used to be conceded as his due. Nor is the dissent without some just ground of reason. Scott, with the artistic instinct granted him in largest measure, had little of the artistic conscience. Writing with the haste of the *improvisatore*, he could exercise over his work, as it proceeded, no jealous rigor of supervision; and on its appearance he was amply pleased with it if the public paid him handsomely. Hence he is an exceedingly irregular writer; many of his works are in structure most lax and careless, and some of the very greatest of them are disgraced by occasional infusions of obviously inferior matter. Yet, all reasonable deductions made, it may be doubted whether in mass and stature he is quite reached by any other novelist who could be mentioned. To class him or even speak of him along with Shakespeare, is absurd; but it is scarcely absurd perhaps to say that, since Shakespeare, to no British man has such wealth in this kind been intrusted. If, as we believe, the final test of greatness in this field be the power to vitalize character, to enrich our experience by imaginative contact with beings ever after more intimately distinct and real for us than the men we daily shake hands with, very few writers can be held to surpass Scott. Further, he invented the historical novel, and in doing so, created a distinct literature, brought life into our conceptions of the past, and revolutionized our methods of writing history itself by a vivid infusion into them of picturesque and imaginative elements. On his *Scotch* novels his fame most securely rests; the others, for the most part, being obviously inferior. Scott's was essentially a great, sagacious, practical intelligence; on the speculative side he was entirely defective. See Lockhart's *Life of Sir Walter Scott* (1837); and the *Life* by Hutton (1878); and Scott's own *Diary*, 1890.

SCOTT, WINFIELD, American general, was b. at Petersburg, Va., of Scottish ancestry, Jan. 13, 1786, was educated at William and Mary college, and studied the profession of law; but in 1808, having a genius for military pursuits, he was appointed capt. of light artillery in Gen. Wilkinson's division, stationed at Baton Rouge, Louisiana, but was suspended for having accused his general of complicity with the conspiracy of Aaron Burr. At the commencement of the war of 1812 he was appointed lieut. col., and

sent to the Canadian frontier. He crossed with his regiment at Queenston heights, where the American troops were at first successful; but on the British receiving re-enforcements, they were repulsed with heavy loss, and Scott was taken prisoner. The following year, having been exchanged, he was appointed adj.gen., and was wounded by the explosion which followed the assault on Fort George. In 1814 as brig.gen. he established a camp of instruction, and from April to July drilled his raw levies in the French tactics with such effect, that on July 3 he took Fort Erie, opposite Buffalo, by assault; and on the 5th fought a sharp drawn battle at Chippewa, and twenty days after the famous frontier battle of Lundy's Lane, in which he had two horses killed under him and was twice wounded, the last time severely. He was raised to the rank of maj.gen., and compiled the general regulations of the army, and translated and adapted from the French the system of infantry tactics, which has since been the text-book of the American army. In the Indian hostilities of the American frontier, in the excitement attending the threat of nullification in South Carolina, and in the Seminole war, Gen. Scott manifested those qualities of wisdom and moderation which made him rather a pacificator than a warrior. During the Canadian revolt of 1837-38 he displayed great tact in allaying the excited passions of the frontier. In 1841 he was appointed commander-in-chief of the U. S. army, and in 1846 directed the military operations in the war against Mexico. Taking the field in person, he, Mar. 9, 1847, landed 12,000 men at Vera Cruz, and invested and bombarded the city, which capitulated on the 26th. April 18 he carried the heights of Cerro Gordo, on the 19th he took Jalapa, on the 22d Perote, and on May 15 Puebla, where, owing to his heavy losses, chiefly by diseases incident to the climate, he was obliged to wait for re-enforcements. On Aug. 10 he advanced, with 10,780 men, to encounter the larger forces and strong positions of Gen. Santa Anna. He turned El Penon, and won the brilliant victories of Contreras and Churubusco. Santa Anna entered upon negotiations only to gain time and strengthen his defenses. These were followed by the sharp and sanguinary battles of Molino El Rey and Churubusco, Sept. 8, strong positions skillfully and bravely defended by superior numbers; and on the 14th Scott entered the city of Mexico at the head of less than 8,000 soldiers. Peace was negotiated with the cession of New Mexico and California to the United States, and the victorious chief was welcomed home with liveliest demonstrations. In 1852 Gen. Scott was the candidate of the whig party for the presidency, but was defeated by one of his subordinate officers, Gen. Franklin Pierce. In 1855 was created for him the office of lieutenant-gen. At the beginning of the war of secession in 1861 he foresaw more than many others its extent and serious character, and advised the calling out a much larger force than was first brought into the field. He had even suggested the advisability of allowing the "wayward sisters to depart in peace." Age and growing infirmities compelled him in Nov., 1861, to retire from active command. He subsequently visited Europe and published his *Memoirs* (8vo, 2 vols., New York, 1864). Scott died May 29, 1866.

SCOTTISH LANGUAGE AND LITERATURE. As the Scots were originally Irish Celts who settled in the western highlands of Alban, the phrase "Scottish language" ought to denote, as it did originally, *Ersch*, or *Gaelic*; but the gradual extension of the authority of the Scottish kings, first over their Celtic neighbors the Picts, then over the Kymry or Cymry (see CELTIC NATIONS) of Strathclyde and the Angles of Lothian and the Merse, led to the name "Scottish" being given to the language of the last of these; though, in reality, the true old "Scottish"—i.e., the Gaelic, the speech of Kenneth MacAlpin and Malcolm Canmore, is further removed from the "Scottish" of Ramsay and Burns (which is simply a dialect of northern English) than the latter is from Russian or Sanskrit. On this point Mr. Murray remarks in a scholarly paper, or rather treatise, in the *Transactions of the Philological Society* for 1873, which bids fair to become a standard authority on the subject: "Ethnologically speaking, the Lowland Scotch dialects are forms of the Angle, or English, as spoken by those northern members of the Angle or English race who became subjects of the king of the Scots. . . . More particularly they are forms of the Northumbrian or northern English—the language of the Northin lede—which up to the war of independence was spoken as one language, from the Humber to the Forth, the Grampians, and the Moray firth; but which, since the final renunciation of attempts upon the independence of the kingdom, has had a history and culture of its own, has been influenced by legal institutions, an ecclesiastical system, a foreign connection, and a national life, altogether distinct from those which have operated upon the same language on the southern side of the border."

Using, then, the term "Scottish" to denote the dialect of English used n. of the Tweed, and omitting all consideration of anything written in Celtic, we may divide the history of *Scottish literature* into two periods; the first extending from the date of the earliest composition to the union of England and Scotland under one king, the second from that time to the present day.

A well-known brief lament for the death of Alexander III. preserved by Wyntoun, and marked by considerable beauty and pathos, is generally supposed to be one of the earliest specimens of Scottish poetry which has come down to us. The first Scottish poet—in the proper sense of the word—was John Barbour (q.v.), archdeacon of Aberdeen, who was born in the first half of the 14th c., and died in 1395. His great work is the poem of *The Brus*, in which he celebrates the struggles and final victory of the Scottish king, Robert I. It is superior to any composition by English writers of the same century, with the exception of Chaucer and Piers the Plowman. The language of

Barbour is even purer English than that used by the great author of the *Canterbury Tales*. There are editions of *The Brus* by Pinkerton, Jamieson, and Cosmo Innes, from a MS. in the Advocates' Library, and by Skeat from a MS. in St. John's coll., Cambridge.

The 15th c., during which England produced no poetical writer of eminence, was fertile in Scottish poets. First in rank, and hardly inferior to any in genius, was James I., king of Scotland, the author of *The Kingis Quhair*—i.e., The King's Quire or Book. Before him, in point of time, was Andrew Wyntoun, prior of Lochleven, who wrote a metrical chronicle, the *Orygynale Cronykil*, which was edited—so far as it treated of Scottish history—by David Macpherson in 1795. Another Scottish poet of this century was Henry the Minstrel, commonly called Blind Harry (q.v.), the author of a poem on the life of sir William Wallace, which in a modernized text was long a favorite in Scotland.

The closing years of this century, and the first half of the next, were distinguished by poets of still higher name. Foremost of these is William Dunbar (q.v.), author of *The Thrissill and the Rois*, *The Goldyn Targe*, and many smaller poems, both serious and satirical, of very high merit. The only complete edition of his works is that by Mr. David Laing, which was published in 1834. Gavin Douglas (q.v.), a son of the earl of Angus, and bishop of Dunkeld, was contemporary with Dunbar. He wrote several original poems, but his principal work is the translation in which he first gave "rude Scotland Virgil's page." A magnificent edition of Douglas has just been published under the editorship of Mr. Small (Edinburgh: Paterson, 1874). The last remarkable writer of this age is sir David Lindsay (q.v.), who died in 1555, and whose poetical works were published in 1806 by George Chalmers, and again in 1871 by David Laing. The 16th c. also produced the first Scottish prose-writers. Among these is the anonymous author of *The Complaynt of Scotland*, recently edited by Mr. Murray, from whom we have quoted above; and John Bellenden, archdeacon of Moray, the translator of Boece's *Scotorum Historie*, and of the first five books of Livy.

With Lindsay ceased that succession of poets writing in the Scottish dialect which had continued without interruption from the time of Barbour. It was more than a century and a half before another made his appearance. Most of the scholars of that time wrote in Latin; but for one vernacular prose work of great merit as a composition, *The History of the Reformation of Religion within the Realme of Scotland*, we are indebted to the leader of the movement, John Knox (q.v.).

We may close our account of this first period by the statement, that down to the period of the reformation every Lowland Scot knew that his language was "Inglish," and the only one who did not speak of it as such was Gavin Douglas. The accession of king James to the crown of England was unpropitious to the vernacular literature of Scotland. The parliament still met at Edinburgh, but the capital had ceased to be the residence of a court, and the language began to be looked upon as a vulgar dialect of the English. The best authors composed in the classic English of the south. It was in that language Drummond (q.v.) of Hawthornden wrote his verses, archbishop Spottiswood (q.v.) and bishop Burnet their histories, and archbishop Leighton (q.v.) and Henry Scougal their theological works, so far as they were not in Latin.

It might have been expected that the union of the kingdoms, by which Scotland was deprived of a legislature of her own, would have soon extinguished the cultivation of the native literature; but as a matter of fact, it turned out to be otherwise. There was a strong popular prejudice against the union, and this roused a deep feeling of nationality, apart from the old religious divisions. At this time appeared the first Scottish poet of true genius since the dark age of the country's literature set in—Allan Ramsay (q.v.), author of *The Gentle Shepherd*, which was published in 1725. Ramsay had also the merit of preserving some of those songs and ballads which have since become so famous, but whose authors are quite unknown. How far these works are the productions of an earlier age, and how far they are the composition of authors living in the 18th c., has been keenly discussed. Reference may be made to *The Romantic Scottish Ballads* of Mr. Robert Chambers on the one side, and to *The Lady Wardlaw Heresy* of Mr. Norval Clyne on the other.

To the deep attachment to the exiled line of kings cherished by a large party in Scotland, and to the interest awakened by the struggles in which this resulted, we owe the exquisite Jacobite songs.

While these feelings were dying away under the influence of the mild government of George III., the close of the century was made famous by the appearance of the most illustrious of Scottish poets. It is almost needless to say a word of Robert Burns (q.v.). Admired by all ranks, he continues to be the chosen classic of the peasantry of the Scottish Lowlands. It is as an English writer that sir Walter Scott (q.v.) is famous; but many of his lyrical pieces, and the dialogues in his novels, where the speakers use their own northern tongue, entitle him to be ranked as the last and greatest of Scottish writers.

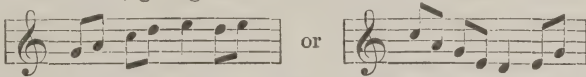
There is, however, no doubt that in spite of the fine and various manifestation of literary genius in the Scottish dialect during the 18th and 19th centuries, that dialect has for the last 200 years been going through a process of uninterrupted decay. The introduction of southern English as the standard or classic form of speech after the union of the crowns, and still more after the union of the parliaments, slowly but surely ruined the old Anglian tongue of Scotland, till most of its peculiarities disappeared, and a jar-

gon grew up that was neither pure English nor pure Scotch, but of which nevertheless Scotchmen are curiously proud. Mr. Murray has happily characterized this jargon in which Ramsay, Fergusson, Burns, Scott, Hogg, and Tannahill wrote as "fancy Scotch."

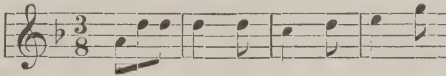
See Craik's *History of English Literature and the English Language* (1864); David Irving's *History of Scottish Poetry* (Edin. 1861); Cosmo Innes's preface to his edition of Barbour's *Brus* (1856); and Murray's Essay in the *Transactions of the Philological Society* (1873); Ross's *Early Scottish History and Literature* (1884).

SCOTTISH MUSIC. Scotland is famed for a class of national airs of a peculiar style and structure, possessing a wild, dignified, strongly marked, and expressive character. They are generally considered to be of great antiquity; the few notes on which the oldest of them turn, and the character of the modulation, lead to the inference that they originated at a time when the musical scale and musical instruments of the country were in a rude state; but there is a deficiency of evidence regarding their early history. No musical MS. of Scottish airs is now known to exist of an older date than 1627; and we have no knowledge when and by whom the early Scottish melodies were composed, or how long they continued to be handed down traditionally from generation to generation. They may not improbably have been committed to notation in the 15th and 16th centuries; and their disappearance is not wonderful, when we take into account, first, the strong measures resorted to, about 1530, by both civil and ecclesiastical authorities, to put down all ballads reflecting on the Roman Catholic hierarchy, and afterward the ill-will shown by the now dominant Presbyterians toward worldly amusements, including not a few that were entirely innocent. The most valuable of now existing early collections of Scotch melodies is the Skene MS., in the Advocates' library, noted down by sir John Skene of Hallyards about the year 1630. It contains a number of native airs, mixed with some foreign dance-tunes—upwards of a hundred in all. Many of the Scotch melodies differ considerably from the more modern versions, presenting in general a ruder outline; but often exhibiting beauties which the changes these airs have subsequently undergone have only tended to destroy.

Among the peculiarities which give its character to the music of Scotland, the most prominent is the prevalent omission of the fourth and seventh of the scale, and consequent absence of semitones, giving rise to such melodic forms as



Passages of this kind occur in all the airs of Scotland which have any claim to popularity, and form one of their most recognizable features. Another characteristic is the substitution of the descending for the ascending sixth and seventh in the minor scale, as at the beginning of the air called *Adew, Dundee*, in the Skene MS.:



A very prevalent course of modulation is an alternation between the major key and its relative minor, the melody thus ever keeping true to the diatonic scale of the principal key, without the introduction of accidentals. An air will often begin in the major key, and end in the relative minor, or the reverse. The closing note is by no means necessarily the key-note, a peculiarity especially remarkable in the Highland airs, which, if in a major key, most frequently terminate in the second; if in a minor, on the seventh. Closes are also to be found on the third, fifth, and sixth. The peculiarities of modulation of the music of Scotland have something in common with the modes of ancient ecclesiastical music, to which it may be more correctly said to belong, than to the modern major and minor keys; and the avoidance of the fourth and seventh may have originated in the imperfection of the ancient wind instruments; yet these peculiarities are not to be found in the national airs of other countries where ecclesiastical music may be supposed to have had the same influence, and the early instruments to have been equally imperfect.

Among the more modern printed collections of Scottish melodies with words, the most important are George Thomson's collection, with symphonies and accompaniments by Pleyel, Kozeluch, Haydn, Beethoven, Hummel, and Weber (vols. i.—iv., 1793–1805; vol. v. 1826; and vol. vi. 1841), one distinguishing feature of which was the appearance of Burns's words conjoined with the old melodies of the country; and a more recent collection in 3 vols. (1848–49). See Macfarren, *Select Scotch Songs* (1841); and Pattison, *Popular Songs of the Highlands* (1881).

SCOTT'S BLUFF, a co. in Nebraska; pop. '90, 1888. Area, 756 sq. m.

SCOTUS AND SCOTISTS. See DUNS SCOTUS.

SCOUGAL, HENRY, 1650–78; b. Scotland; educated at the university of Edinburgh; appointed professor of philosophy in Aberdeen in 1669, and of divinity in 1674; was ordained and settled at Auchterless. In this retired place he wrote in 1677, *The Life of God in the Soul of Man*, a work distinguished for its earnest piety and for the purity and elegance of its style. It was edited by bishop Burnet, and has been often reprinted.

SCOURGE OF GOD. See ATILA.

SCOUT, a person sent out in the front or on the flank of an army to observe the force and movements of the enemy. He should be a keen observer, and withal fleet of foot or well mounted.

SCRANTON, city and co. seat of Lackawanna co., Pa., on the Lackawanna river and the Central of New Jersey, the Delaware and Hudson, the Delaware, Lackawanna, and Western, the Erie and Wyoming valley, and the New York, Ontario, and Western railroads; 18 miles n.e. of Wilkesbarre. It was settled in 1840 by Joseph H. and George W. Scranton; was incorporated as a borough in 1854; and was chartered as a city in 1866. It is built on a plateau in a beautiful valley, and is the center of the great anthracite coal region of the state. The city is regularly laid out; has numerous public parks, squares, and driveways; and contains a U. S. government building, court-house, municipal building, Taylor hospital, Albright public library, the Pennsylvania oral school for the deaf, college of St. Thomas (R. C.), the school of the Lackawanna (Pres.), St. Cecilian academy (R. C.), Green Ridge school, Y. M. C. A., Lackawanna institute of history and science, Lackawanna law and library association, Welch philosophical society (the last four with libraries), and several hospitals. There are gas and electric lights, electric street railroads, national and state banks, several building and loan associations, over 70 churches, and public school property valued at \$1,000,000. Its manufactures, chiefly iron and steel, employ a capital of over \$16,000,000, and have an annual output valued at over \$25,000,000. Pop. '90, 75,215.

SCRANTON, JOSEPH H., 1813-72; b. Conn.; removed to the coal region of the Lackawanna valley in 1847, and built up Scranton into a large city. He was long president of the Lackawanna coal company, and of many railroads, banks, and iron-manufacturing corporations. His brother, GEORGE W., 1811-61, was also in the iron business, president of several railroads, and member of congress from 1859 to his death.

SCRAP-METAL, a term applied to fragments of any kind of metal which are only of use for remelting. Copper and brass scrap consist of the turnings from the lathe, and all useless and worn pieces, whether old or new. They are readily remelted. Scrap-tin consists of the clippings and fragments of tinned iron and worn-out tinned vessels; these are frequently dipped into hydrochloric acid, to dissolve off the tin-coating from the iron; and the muriate of tin so formed is of commercial value for dyeing purposes. Scrap-iron consists of any waste pieces of iron, although the term is usually held to mean malleable iron only; and for many purposes it is particularly valuable, as it is found that a greater strength can be obtained by welding small fragments of iron together than is found in large masses, the fiber being much more twisted and interwoven, from the mingling of pieces in every imaginable direction.

SCREAMER, *Palamedea*, a genus of birds of the order *grallæ*, allied to the jacanas (q.v.). The bill is rather short, conical, curved at the extremity; there is a bare space around the eyes; the toes are long; each wing is furnished with two strong spurs. The **HORNED SCREAMER**, or **KAMICHI** (*P. cornuta*), inhabits swamps in Brazil and Guiana, and feeds on the leaves and seeds of aquatic plants. It is of a blackish-brown color, nearly as large as a turkey, and has somewhat the appearance of a gallinaceous bird. It receives its name from its loud and harsh cry. From the head, a little behind the bill, there rises a long, slender, movable horn, of which no use has been conjectured. The spurs of the wings are supposed to be useful in defense against snakes and other enemies.—Closely allied to this genus is the genus *chauna*, or *epistolophus*, to which belongs the **CHAUNA**, or **CRESTED SCREAMER** (*C.* or *O. chaunaria*), a native of Brazil and Paraguay, the head of which has no horn, but is adorned with erectile feathers. The plumage is mostly lead-colored and blackish. The wings are armed with spurs. It is very capable of domestication, and is sometimes reared with flocks of geese and turkeys, to defend them from vultures, being a bold and powerful bird.

SCREEN, in architecture, an inclosure or partition of wood, stone, or metal work. It is of frequent use in churches, where it shuts off chapels from the nave, separates the nave from the choir, and frequently incloses the choir all round. Such screens are often much ornamented, the lower part being solid, and the upper very often perforated. The rood-screen (q.v.) is that on which most labor is usually bestowed. In England many beautifully carved screens in stone, enriched with pinnacles, niches, statues, etc., remain, such as those of York, Lincoln, Durham, etc.; and specimens in wood, carved and painted, are common in parish churches. In France the screen round the choir is sometimes the subject of beautiful sculptures, as at Amiens and Paris. In halls (q.v.) there was usually a wooden screen at one end to separate the entrance-door and a passage from the hall. Over this was a gallery. The term "screen of columns" is also applied to an open detached colonnade.

SCREVEN, a co. in e. Georgia, adjoining South Carolina; bounded on the e. by the Savannah river, on the s.w. by the Ogeechee river; crossed by the Sylvania and the Georgia Central railroads; 786 sq. m.; pop. '90, 14,424, chiefly colored. The surface is level. The soil is sandy. The principal productions are corn and cotton. Co. seat, Sylvania.

SCREW, one of the mechanical powers (q.v.), is a modification of the inclined plane (q.v.), as may be shown by wrapping a piece of paper in the form of an inclined plane round a cylinder. In the screw, the spiral line, formed by the length or slope of the plane, is raised up in a ridge, and a lever is attached for the purpose of working it, so that the screw is really a compound machine, combining the lever and the inclined plane.

It may be used as an instrument for penetration, as in the auger, gimlet, etc., or as a means of producing pressure, the latter being its most important application as a mechanical power. For this purpose it is made to work in a "female screw" or nut (a hollow cylinder grooved on the inside, so as to correspond to the threads of the screw); the nut is then firmly fixed in a massive frame, and the revolution within it of the screw causes the lower extremity of the latter to advance or recede. The principle of the screw's application is the same as that of an inclined plane pushed further and further under a heavy body so as to raise it up. Now in the inclined plane, P , the power or force, is to W , the weight raised or the pressure overcome, as the height of the plane to its base; that is, in the screw, as the distance between two threads is to the circumference of the cylinder. But as the twist is not applied at the circumference of the cylinder directly, but by means of a lever, it follows that the power applied, P , is to W , as the distance of two threads to the circumference described by P at the end of the lever. We see, then, that the power of the screw is increased by diminishing the distance between the threads; but as this cannot be effected without weakening the instrument, there is an evident limit to the increase of power in this way. The power can also be increased by lengthening the lever; but the best mode is that proposed by Mr. Hunter (in the *Phil. Trans.* vol. 17), in which are employed two screws of different fineness, the coarser of them hollow and grooved, to act as a nut for the other. The outer and coarser screw is the one to which the power is applied by a lever, and it is adjusted in the manner before described; the inner is so fastened as to be capable of vertical motion only. When the outer screw is turned so as to move its extremity downward, the inner screw moves upward, but not to the same amount; thus, if the outer screw have 6 threads to the inch, and the inner one 7, one turn of the outer screw depresses it $\frac{1}{6}$ of an inch, but as the inner one rises $\frac{1}{7}$ of an inch, the whole descent of the point which produces pressure is only $\frac{1}{6} - \frac{1}{7}$, or $\frac{1}{42}$ of an inch; hence the pressure applied is 7 times greater than could be given by the outer, 6 times greater than could be given by the inner screw, and equal to what would be given by a screw with 42 threads to the inch, with the same power applied. The advantage of Hunter's screw is that the threads may be any thickness, and consequently each screw any strength we please, provided the difference be small enough. The screw is one of the most powerful of the mechanical powers, but the friction generated by it amounts to about $\frac{1}{3}$ of the force applied. The common screw, fitted with a coarse thread for insertion in wood, is called the *wood-screw*. Machine screws, or otherwise fine-thread screws, are used in metals. Screws were little known or used before 1836, being rudely made by hand with imperfect tools. The head was forged or swedged up by a blacksmith; the thread and nick were formed by the use of hand dies and hack screws. In 1836 American ingenuity was directed to the subject, and the old hand tools were associated in machines having the capacity of imparting to each tool its proper motion. The swedge hammer became the heading machine, receiving the end of a coil of wire and regularly cutting the required length for a blank, which then received such a blow as to "set up" one end of the wire to form the head—the operation continuing automatically until the whole coil was made into blanks. These blanks were then handled individually and presented to organized machines, first for shaving the head, then for nicking, and lastly for cutting the thread. The above constitutes the second era in this manufacture; and such machinery, partly automatic, was all that was in use before 1846. Then a third era ensued, and an entire revolution was effected by constituting the machines entirely automatic. The blanks are by this system supplied in mass by the operator, the machine separating and handling each blank respectively as the nature of the operation demands, and producing with wonderful rapidity, regularity, and perfection. Chief among the inventors and constructors of this machinery was gen. Thomas W. Harvey (b. Vt., 1795; d. 1854), widely known for inventive genius in many directions. After him, perfecting and developing, were Sloan, Whipple, Rogers, and others; while the leading mind that organized this intricate business into probably the most successful manufacturing interest in this country was the late William G. Angell of Providence, R. I., president of the American screw company. Gen. Harvey was the first inventor of the partially automatic and of the entirely automatic machines. It is noticeable that though he produced gimlet-pointed screws in 1836, it was not till 1846 that any considerable market was found for them. His son, Hayward A. Harvey of Orange, N. J., likewise a skillful inventor in many departments, has made important improvements in the automatic machines, and this American invention is now in use throughout the world wherever screws are made. It is estimated that the consumption of screws throughout the world is not far from 100,000 gross per day—about 100 tons; and about 500 tons of iron are required for the daily production of machine and wood screws.

SCREW-DRIVER, a chisel-shaped tool, used for turning round, and so driving in or drawing out the common joiners' screw-nails, the heads of which have a cleft made to receive the edge of the screw-driver.

SCREW-PINE, *Pandanus*, a genus of plants of the natural order *pandanaceæ*, natives of the tropical parts of the east and of the South Sea islands. Many of them are remarkable for their adventitious roots, with large cup-like *spongioles*, which their branches send down to the ground, and which serve as props. Their leaves are sword-shaped, with spiny edges, and are spirally arranged in three rows. In general appearance, when

unbranched, they resemble gigantic plants of the pineapple, whence their popular name. *P. odoratissimus* is a widely diffused species, a spreading and branching tree of 25 ft. high, much used in India for hedges, although it takes up much ground. In the s. of India it is called the Kaldera bush. It grows readily in a poor soil, and is one of the first plants to appear on newly-formed islands in the Pacific. The male flowers are in long spikes, the female flowers in shorter branches. The flowers are frequently gathered before expanding and boiled with meat. Their delightful and very powerful fragrance has made the plant a favorite everywhere, and it is the subject of continual allusions in Sanskrit poetry under the name *Ketaka*. Oil impregnated with the odor of the flowers, and the distilled water of them, are highly esteemed East Indian perfumes. The seeds are eatable, and the fleshy part of the drupes, which grow together in large heads, is eaten in times of scarcity, as is the soft white base of the leaves. The terminal buds are eaten like those of palms. The spongy and juicy branches are cut into small pieces as food for cattle. The leaves are used for thatching, and for making a kind of umbrella common in India, and their tough longitudinal fibers for making mats and cordage. The roots are spindle shaped, and are composed of tough fibers; they are therefore split up by basket-makers and used for tying their work.—More valuable, however, as a fibrous plant is an allied species, *P. sativus* or *P. vacoa*, the VACOA of Mauritius, which if permitted grows to a height of about 30 ft., but from continual cropping of its leaves is usually dwarfed to 6 or 10 feet. The fibers of its leaves are used for making the *vacoa* bags, which constitute so considerable an article of export from Mauritius, rivaling in cheapness and usefulness the gunny bags of India. The leaves are cut every second year, and each plant yields enough to make two large bags. Immediately on being cut off the leaves are split into fillets, which are nearly an inch broad at the base, but taper to a point, and are 3 or 4 ft. long. One of these will support a bag of sugar of about 140 lbs. without breaking. The aerial roots of the vacoa are so fibrous as to be used for making paint-brushes for coarse purposes.

SCREW-PROPELLER, THE, is of the same construction as the common screw (q.v.), but with the narrow thread exaggerated into a broad, thin plate, and the cylinder diminished to a mere spindle.

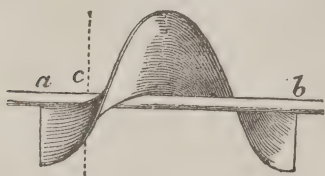


FIG. 1.

the case lies between the two just supposed, the screw moves forward, and with it the ship, and the water in which it has been working moves backward. The backward motion should only be small proportionately, and the ratio between it and the sum of the backward motion of the water and the forward motion of the ship is called the *ship*, which in well-designed vessels has a value of from 0.1 to 0.25.

It is obvious also that on the same spindle there may be more than one blade, provided that all the blades have the same pitch or rate of progression along the spindle (in fig. 1 *ab* is the *pitch* of the screw). Screws have thus been formed with two, three, four, and six blades or arms, but the form most commonly used is two blades for ships of war, and three or four blades in the merchant service.

If the screw be cut off before attaining the length *ab* of a whole convolution, as at *c*, the portion *ac* will still retain all the properties of the screw. In the earlier attempts screws were tried of the length of a whole convolution, or even two whole turns; but experiment has since shown that this length is a disadvantage. The best results are obtained when the sum of the lengths, measured parallel to the center line of the shaft of all the blades, is equal to about 0.4 of the pitch. This holds equally good for two, three, or four bladed propellers, so that if *n* equals the number of blades, then the length of one blade, or *ac*, would be expressed by the equation $ac = \frac{0.4 ab}{n}$. A four-

bladed screw of this kind, and of a form very generally used in the merchant navy, is shown in fig. 2.

The following are the technical terms applied to the screw-propeller. The *shaft* is

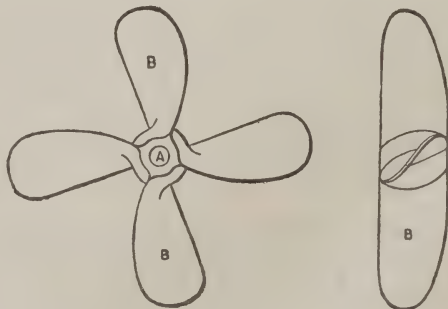


FIG. 2.

the cylindrical axis on which the screw revolves, and is the medium for communicating to it the power of the steam-engine; the *blade* is the thread of the screw; the *pitch*, the length of shaft on which the blade would make one complete turn; the *diameter* is the distance between the tips of opposite blades; and the *length* is the distance from the front to the back edge of blade projected upon a fore and aft plane.

The application of the screw to the propulsion of a vessel through the water is not new. In 1802 Dr. Shorter, an English mechanic, produced motion by its agency; but his discovery was valueless, as the steam-engine had not then been practically applied to navigation. Those who first employed Watt's engine on board ship adopted the paddle-wheel, the success of which turned attention from the screw for nearly thirty years. At length, in 1832, Mr. B. Woodcroft patented a screw-propeller with an increasing pitch; and four years later, Mr. F. P. Smith patented a screw making two whole turns, which he reduced in 1839, to one whole turn. In 1837 he and Capt. Ericsson, an American inventor, brought the matter practically forward on the Thames, where a small screw-steamer, 45 ft. long, 8 ft. broad, and of 27 in. draught, towed the *Toronto* of 630 tons against tide at $4\frac{1}{2}$ knots an hour. In 1839 an American gentleman had the *Robert Stockton* built for him by Messrs. Laird, with which he reached America. The British admiralty, however, refused any support to the new propeller, until the success of the *Archimedes*, built in 1838, of 232 tons and 80 horse-power, which was exhibited at the principal ports, rendered opposition no longer possible. The admiralty, then, as an experiment, constructed the *Rattler*, from the trials of which vessel many valuable data for the screw-propeller have been derived. Meanwhile, in 1838, Mr. James Lowe had shown that the length of the screw should not exceed $\frac{1}{4}$ th of the pitch; and after actual and successive trials, the screw of the *Rattler* was cut down from 5 ft. 9 in. to 1 ft. 3 inches. These experiments established the screw as a rival to the paddle-wheel; and its advantage for ships of war became incontestable, as, from the entire submergence of the propeller, and consequent lowness of its engines in the ship, the chances of injury from an enemy's shot were reduced almost to nothing. Some of the great steam-companies—notably the Peninsula and Oriental company—also patronized it, and it was found of great value as an auxiliary in sailing-vessels. The result is that, at this time, its use in the American navy is almost universal, except in cases where want of sufficient depth of water, or other special circumstance, causes the paddle-wheel still to be employed.

Several varieties of screw have been introduced, each finding many supporters. The one which was for many years used in the British navy was invented by Mr. R. Griffiths. In it the blades, in place, of rising from a small boss, as in fig. 2, spring from a hollow sphere occupying $\frac{1}{4}$ the screw's diameter. This arrangement was adopted because experiment proved that the central portions of the blades of the ordinary screw absorb about 20 per cent of the propelling power, while they produce little useful effect, from the circumstance that at that part (especially in screws of a coarse pitch) the blade is nearly in a line with the shaft, and acts at right angles on the water, causing only a disturbance of that portion on which the outer and more powerful end of the blade operates. The globe, on the other hand, revolves with little friction. A further improvement was effected by bending the tips of the blades a little over backward, so that the face of the blade striking the water was partly convex. The older propellers had blades which increased in width uniformly from boss to tip. These were found to create much vibration in the ship, and the "leading" corner is therefore rounded away, as shown in fig. 2. This is also done in Griffiths's propeller, but he probably carries the principle to excess in cutting away also the "following" corner, and so lessening the effective surface of the blade. A propeller invented by Mr. Hirsch, and known by his name, has been lately successfully tried by the Admiralty, and may probably be much used by them in future.

One difficulty in the use of the screw as an auxiliary in sailing-ships is that in a good wind the screw seriously impedes the sailing. To prevent this, various devices are resorted to. In some cases, the screw is disconnected from the shaft, and left to revolve freely; in others, as in most ships of war, it is disconnected and hoisted altogether out of the water by means of an iron framework worked above the screw in a sort of well. Messrs. Maudslay have patented a "feathering-screw," which, by a simple apparatus, can, when the steam-power is not required, have the blades turned into a line with the ship's keel, and the screw (which must be two-bladed) fastened in a vertical position. When thus treated, the screw is out of danger, and forms no impediment to the ship's progress.

The usual position for the screw is immediately before the stern-post, the shaft on which it revolves passing, parallel to the keel, into the engine-room. Many vessels have been built, especially for the great transatlantic companies, with two screws, one under each quarter. These have independent action, and as one can therefore be reversed while the other goes ahead, great steering-power is imparted; so much so, that vessels constructed on this principle are said to be able to turn in their own length. For a given power, a twin-screw vessel draws less water, owing to the lessened diameter of the propellers, than an ordinary screw-steamer. As the action of the screw depends on the comparative immobility of the water in which it acts, it is necessary, for the development of its full power, that it should be completely immersed, and that there should be

nearly 2 ft. of water above the top of the upper blade. It follows from this that, *ceteris paribus*, the screw-vessel will draw more water than the paddle-steamer; for in large steamers the screw is from 15 to 18 ft. in diameter, and in the *Great Eastern* it reached 24. See **STEAM NAVIGATION**.

It now only remains to notice the comparative advantage of the paddle and screw. Under favorable circumstances, in ships of equal tonnage and power, there is little difference in speed or force. Before the wind, the paddle has a slight advantage; with the wind ahead, the resistance offered by the paddle-boxes transfers the advantage to the screw. Fastened stern to stern, the screw-ship drags the paddle-ship; but fastened bow to bow, the same result is not found. This is, however, rather to be attributed to the loss of power in a paddle ship when not in progress (see **PADDLE WHEEL**), than to any actual superiority of screw. In a long voyage, however, the gain is distinctly with the screw; because the weight of fuel borne at starting sinks the paddles too low in the water, and probably its exhaustion at the end of the voyage deprives them of their proper dip; whereas, with ordinary management, the screw will always be immersed. Again, rolling deprives the paddle of much power; while pitching deprives the screw of its proper matrix; but the balance of loss in tempestuous weather is in favor of the screw. It has been already shown that in men-of-war the screw is the most useful agent; and as an additional reason may be adduced the clear broadside which it allows for the guns. On the other hand, in point of comfort to the passengers, the advantage lies unquestionably with the paddle; for the rapid revolution of the heavy screw on a shaft extending half the ship's length, produces a continuous and very unpleasant vibration; while the lower position of the engines and screw gives the vessel a deep roll. For lakes and rivers, where the water is smooth and the voyage short, paddles are best, and more especially so when the water becomes often shallow or is choked with weeds, which would soon clog the screw.

In scientific language the motion of a vessel by means of a screw, is said to be due to the forward reaction of the water in which the propeller revolves upon the blades, and through them upon the whole vessel. In order that this useful reaction may bear the largest possible ratio to the work done by the engine, it is essential that the form of the ship aft should be such as will secure that plenty of water shall always have access to the forward side of the screw as the vessel goes along. This has been demonstrated by the experimental alterations in the after-body of the *Dwarf* (1846), and still more strikingly by placing a disk of the same diameter as the propeller in front of it. If the propeller be worked in these circumstances, the vessel will not move forward at all, although the power given out by the engines remains as before.

SCREW-WRENCH, a tool used for grasping the flat sides of the heads of large screws, such as are used in engines and other large works. The heads are usually octagonal laterally, and the wrench is made of two portions like hammers sliding one upon the other, so that screw-heads can be grasped of different sizes, and the handle forms the lever by which they are turned round. The screw-key is only a more simple kind of wrench, which will only act upon screws of two sizes, fitting the jaws at each end.

SCRIBBLER. See **SPINNING**.

SCRIBE (Heb. *Sofer*; Gr. *Grammateus*, *Nomodaskalos*), among the Jews, originally a kind of military officer, whose business appears to have been the recruiting and organizing of troops, the levying of war-taxes, and the like. At a later period, especially at the time of Christ, it had come to designate a learned man, a doctor of the law. Christ himself recognizes them as a legal authority (Matth. xxiii. 2); they were the preservers of traditions, and formed a kind of police in the temple and synagogues, together with the high-priests; and the people revered them, or were expected to reverence them, in an eminent degree. They were to be found all over the country of Palestine, and occupied the rank and profession of both lawyers and theologians. Their public field of action was thus probably threefold: they were either assessors of the sanhedrim, or public teachers, or administrators and lawyers. Many of these teachers had special class-rooms somewhere in the temple of Jerusalem, where the pupils destined to the calling of a Rabbi sat at their feet. The calling of a scribe being gratuitous, it was incumbent upon every one of them to learn and exercise some trade. Those scribes who were not eminent enough to rise to the higher branches of their profession, to enter the sanhedrim, to be practical lawyers, or to hold schools of their own, occupied themselves in copying the book of the law or the prophets, in writing phylacteries, contracts, letters of divorce, and the like. Their social position was naturally in accordance with their talents and their importance. The apostles, not learned enough, for the most part, to be scribes, are promised to become "scribes" of the kingdom of God, etc. See **PHARISEES**, **HALACHA**, **HAGGADA**, **MIDRASH**, **MISHNA**, **TALMUD**.

SCRIBE, AUGUSTIN EUGÈNE, a French dramatic writer, son of a wealthy silkmercer of Paris, was born in 1791. Educated for the legal profession, he soon deserted it for dramatic authorship. His first piece, *Les Dervis*, written by him in conjunction with Germain Delavigne (brother of Casimir Delavigne), was played in 1811, but till 1816 he cannot be said to have achieved a decided success. Since that time, pieces, chiefly vaudevilles, from his pen have followed each other with the most astonishing rapidity;

and in such demand were they at the hand of theatrical managers, that Scribe established a sort of dramatic manufactory, in which numerous *collaborateurs* were constantly at work under his supervision. His plots are interesting, and his dialogue, light and sparkling; and not a few of his pieces have been adapted for the English stage. Scribe also wrote various novels, and composed the *libretti* for a considerable number of well-known operas, including *Masaniello*, *Fra Diavolo*, *Robert le Diable*, and *Les Huguenots*. He was admitted a member of the French academy in 1836, and died Feb. 20, 1861.

SCRIBING, in joinery, fitting the ends of pieces of wood together, so that the fibers may be at right angles, and the end cut away across the fibers.

SCRIBNER, CHARLES, 1821-71, b. New York; grandson of a Presbyterian minister; educated at the university of New York, and Princeton college, where he graduated in 1840. He studied for the bar, but on account of feeble health, did not begin practice. In 1846 he formed a partnership with Isaac D. Baker in the book-selling and publishing business in New York, and published the works of Headley, Willis, Mitchell ("Ik Marvel"), Dr. Holland, McCosh, Dr. Bushnell, etc. In 1857 the firm associated with it Mr. Charles Welford, and entered heavily into the importation of books from England: it also entered extensively into the manufacture of educational books, and in 1870 established *Scribner's Monthly*, which under the editorship of Dr. J. G. Holland, achieved great popularity. On the death of Mr. Scribner, in 1871, the firm was re-organized under the name Scribner, Armstrong & Co. It is now known as Charles Scribner's Sons.

SCRIP is a certificate (usually about the size and appearance of a bank-note) of a person's share or shares in a joint-stock undertaking. It is issued on the party signing a contract of copartnery, and is retained by him until an act of the legislature, or some other formality, establishes the company, and authorizes the opening of regular books for entering the names of shareholders and the transfer of stock. In many instances scrip is unauthorizedly sold, and made an object of speculation; the party to whom it was assigned, however, remains bound by the contract which he has subscribed, until relieved of his obligations by transfer in the company's books.

SCRIVEN, EDWARD, an English engraver in the chalk and dotted manner, was born at Alcester in 1775 and died in 1841. He is best known as an illustrator of many costly books.

SCRIVENER, FREDERICK HENRY AMBROSE, LL.D., b. England, 1813; graduated at Trinity college, Cambridge, 1835; became assistant-master of the King's school, Sherborne; curate of Sandford, Orcas, Somerset, in 1839; was appointed head master of Falmouth school in 1846; rector of Gerrans, Cornwall, in 1861; in 1870 one of the English company of revisers of the authorized version of the New Testament. He has published *A Supplement to the Authorized Version of the New Testament; A Collation of about Twenty Manuscripts of the Greek Testament deposited in England; Contributions to the Criticism of the New Testament, being the Introduction to the Codex Augiensis and Fifty other Manuscripts; Novum Testamentum Græcum, text of Stephens of 1550, with Various Readings of Beza, Tischendorf, Tregelles, etc.; Plain Introduction to the Criticism of the New Testament; Cambridge Paragraph Bible.* He d. in 1891.

SCRIVENER'S PALSY, or **WRITER'S CRAMP**. A nervous disorder whose location is in the motor nerves of that part of the hand usually engaged in holding the pen. It is accompanied by pain and by symptoms of paralysis, which in some cases it practically is. Under its influence the muscular movements of the thumb and forefinger become uncontrollable; and if the effort to write be continued, despite the warning symptoms, the writing is illegible, while the disorder is increased. Of late years it has become much the custom with those who are professional writers to hold the pen between the fore and middle fingers, thus avoiding the strain on the muscles and nerves of the thumb, and gaining a better support for the pen itself than is afforded by the old conventional method so tenaciously adhered to by writing-masters. The treatment of writer's cramp includes rest and a stimulating diet, tonics, especially iron, with sometimes the application of a galvanic current to the part involved, and sometimes the use of strychnine, by prescription.

SCROFULA, or **SCROPHULA**, was, until the last quarter of a century, regarded as consisting essentially of indolent glandular tumors, occurring frequently in the neck, suppurating slowly and imperfectly, and healing with difficulty. Recent pathologists, however, have given a more extended meaning to the word *scrofula*. According to them it signifies a certain disease or defect of the constitution, in which there is a tendency to the production and deposition of a substance called *tubercle* in various tissues and organs; and tubercle must thus be regarded as the essential element of scrofula. It does not follow, however, that a deposit of tubercle should actually occur in every case of scrofula. The *tendency* is present, and the absence or presence of the deposit depends upon the extent of the affection, and is determined by various causes.

Sir James Paget, one of the most eminent pathologists, very clearly sums up what is generally understood by scrofula in the following paragraph: "It is a state of constitution distinguished in some measure by peculiarities of appearance even during health,

but much more by peculiar liability to certain diseases, including pulmonary phthisis. The chief of these "scrofulous" diseases are various swellings of the lymphatic glands, arising from causes which would be inadequate to produce them in ordinary healthy persons. The swellings are due sometimes to mere enlargement, as from an increase of natural structure, sometimes to chronic inflammation, sometimes to an acute inflammation or abscess, sometimes to tuberculous disease of the glands. But besides these, it is usual to reckon as "scrofulous" affections certain chronic inflammations of the joints; slowly progressive "carious" ulcerations of bones; chronic and frequent ulcers on the cornea, ophthalmia (q. v.), attended with extreme intolerance of light, but with little, if any, of the ordinary consequences of inflammation; frequent chronic abscesses; pustules, or other cutaneous eruptions, frequently appearing upon slight affection of the health or local irritation; habitual swelling and catarrh of the mucous membrane of the nose; habitual swelling of the upper lip." It is obvious that although the above-named forms of disease are often more or less coincident, they have nothing sufficiently in common to justify the general appellation of *scrofulous*. They are certainly not all tuberculous diseases, and hence sir James Paget doubts whether the proposal to make *scrofulous* and *tuberculous* commensurate terms is practical, since the former, as generally employed, has a much wider significance than the latter.

The word is derived from the Lat. *scrofa*, a sow, it being supposed that this animal was especially liable to tumors such as occur in this disease. The Greek and Arabic names for the disease are similarly derived from the words signifying "swine" in these languages. While *scrofula* was the popular, *struma* (supposed to be derived from *struo*, I heap up) used by Celsus, Pliny, and other Latin writers, was the classical name for the disease. The vulgar English name, *the king's evil*, is derived from the long-cherished belief that scrofulous tumors and abscesses could be cured by the royal touch. Multitudes of patients were submitted to this treatment, and, as the old historians assert, with perfect success, from the time of Edward the confessor to the reign of queen Anne. The writer of the article "scrofula" in *The English Cyclopædia*, mentions the curious historical facts that "the old Jacobites considered that this power did not descend to Mary, William, or Anne, as they did not possess a full hereditary title, or, in other words, did not reign by divine right. The kings of the house of Brunswick have, we believe, never put this power to the proof; and the office for the ceremony, which appears in our liturgy as late as 1719, has been silently omitted. The exiled princes of the house of Stuart were supposed to have inherited this virtue. Carte, in the well-known note to the first volume of his *History of England*, mentions the case of one Christopher Lowel, who, in 1716, went to Avignon, where the court was then held, and received a temporary cure, and when prince Charles Edward was at Holyroodhouse in Oct., 1745, he, although only claiming to be prince of Wales and regent, touched a female child for the king's evil, who in 21 days is said to have been perfectly cured." The practice was introduced by Henry VII. of presenting the patient with a small coin (gold or silver). The French kings also touched for the "evil," the practice being traced back to Clovis, 481 A.D. On Easter Sunday, 1686, Louis XIV. is said to have touched 1600 persons, using the words: *Le roy te touche; Dieu te guerisse* (the king touches thee; may God cure thee). See Chambers's *Book of Days*, i. 82. The literature of this curious subject is somewhat extensive. The reader who wishes to pursue the inquiry further is referred to Tooker's *Charisma, sive Donum Sanctionis*, etc., 1597; Browne's *Charisma Basilicon, or the Royal Gift of Healing Strumæ*, etc., 1684; and Beckett's *Free and Impartial Inquiry into the Antiquity and Efficacy of Touching for the King's Evil*, 1722. The subject is also examined by bishop Douglas in his *Criterion, or Miracles Examined*, 1754; by Colquhoun, in his *Isis Revelata*, 1836 (who attributes the cure to animal magnetism); and by Howitt in his *History of the Supernatural in all Ages and Nations*, 1863.

Scrofula is a disease of early life, and when it does not exhibit any of its manifestations before the period of maturity it seldom shows itself afterward.

In all systematic descriptions of this disease, two varieties of the scrofulous habit or diathesis are given, viz., the *sanguine* or *serous*, and the *phlegmatic* or *melancholic*. In the *sanguine*, there is a general want of muscular development, the limbs being soft and flabby; the skin is fair and thin; the features are delicate, the rosy hue of the cheeks contrasting strongly with the surrounding paleness; the eyes are gray or blue, and the eye-lashes long and silken; the hair fine and light-colored or reddish; and the ends of the fingers broad and expanded, with convex nails bent over them; the intellect is lively and precocious, and there is often considerable beauty. In the *phlegmatic* variety the skin is pale or ruddy, dark, and often harsh; the general appearance dull and heavy; the hair dark and coarse; and the mind usually slow and torpid.

Children in whom the scrofulous constitution is strongly marked often present that narrow and projecting form of the chest to which the term "pigeon-breasted" is commonly given; moreover, the abdomen is enlarged, the limbs wasted, and the circulation languid, in consequence of which they are especially liable to chilblains. The digestive organs are so commonly affected—as is evidenced by irregular action of the bowels, fetid breath and evacuations, furred tongue, capricious appetite, etc.—that, in the opinion of the late Dr. Todd, "strumous dyspepsia presents a more characteristic feature of this habit of body than any physiognomical portrait that has been drawn of it." In the great majority of cases the scrofulous disposition is hereditary; indeed,

there is no disease which is nearly so often transmitted from parent to offspring as scrofula. There is, however, scarcely any doubt that it may be acquired under the action of various unfavorable exciting causes, which may be ranked together "as causes of debility." Among them may be especially noticed (1) Insufficient and improper food; (2) Impure air; (3) Insufficient exposure to direct sunlight; (4) Exposure to wet and cold, and to sudden changes of temperature, especially if the clothing be insufficient; (5) Excessive and continued fatigue, whether bodily or mental; and (6) Intense and prolonged anxiety or mental depression.

We shall first lay down the general principles of treatment to be adopted with the view of improving the health in the case of a person presenting either merely the general indications of a scrofulous habit of body, or some of its local manifestations, and we shall then conclude with a brief notice of a few of those particular forms of the disease which most frequently come under the attention of the medical practitioner.

The diet should be nutritious and sufficiently abundant, and animal food should be given at least twice daily. Dishes containing eggs and milk may usually be taken with advantage. If the patient is not very young, a little bitter ale taken at an early dinner will often promote digestion; if, however, it causes flushing or much sleepiness, it must be discontinued. A mother with scrofula should always provide a healthy wet-nurse for her child, as suckling in such a case is injurious both to parent and offspring. Flannel should always (both in summer and winter) be worn next the skin during the day, and the clothing must always be sufficient to keep the extremities warm. Constant residence in pure and dry air should be enforced as far as possible. Unfortunately, the climate of Great Britain is by no means favorable to those possessing the scrofulous habit, and it is often very difficult for the physician to decide as to the choice of the most suitable residence. On this subject, Mr. Savory, in his essay on "Scrofula" in Holmes's *System of Surgery*, vol. i., 1860, remarks that "it is surely a mistake to suppose that a warm climate is the best adapted to all cases of scrofula. It is doubtless so in the great majority in which the disease [in the form of pulmonary consumption] is far advanced; but in many cases at an earlier stage, its further development is more satisfactorily arrested and the general health improved by a more bracing air. Children with tuberculous glands, but whose general health appears otherwise tolerably good, would perhaps profit less by transportation to Madeira or Egypt than by residence in the s.w. coast of England, where the atmospheric changes are less frequent and sudden than in other parts of the kingdom, and the winter is comparatively mild. Delicacy of constitution is sometimes increased, and mischief encouraged, by dread of exposure." Free exercise of the muscles and lungs in the open air should be insisted on in fine weather, and if this cannot be taken, the best substitute is friction over the surface of the body with the flesh-brush. Patients who can bear cold sea-bathing during the summer and autumn months will derive great advantage from it; but if a short immersion is not rapidly followed by a genial glow after drying the skin, such bathing is injurious, in which case warm salt-baths will be found useful. Too much stress cannot be laid upon the fact that in the case of children the mind should be cheerfully occupied, but not overtasked. The medicines most esteemed in the treatment of scrofula are iodine and its compounds, the salts of iron, bark, sarsaparilla, the alkalies and mineral acids, and, above all, cod-liver oil. As the choice of the individual remedy must be left to the physician, we will merely remark that iodine and iron may often be advantageously prescribed together either in the form of the syrup of the iodide of iron, or of a well-known French preparation known as Blancard's iodide of iron pills; and that to derive full benefit from cod-liver oil, it must be taken for a long time. As Mr. Savory remarks, the oil should be regarded as an article of diet rather than a medicine. A tablespoonful may be considered as a full dose for an adult; but this quantity should be gradually arrived at, the dose commencing with a teaspoonful. It is most easily taken when floating on a mixture of orange wine, or some other pleasant bitter fluid, with water. The lightest and clearest oil is probably the best, and in cold weather it should be slightly warmed before it is taken, for it is thus rendered more liquid and more easily swallowed. If what are commonly known as "bilious symptoms" supervene, the use of the oil should be suspended for a couple of days, and a few gentle aperients should be prescribed.

Excluding pulmonary consumption, in which the leading pathological feature is the deposit of scrofulous matter or tubercle in the lungs, one of the forms of scrofula which most frequently presents itself is in the *lymphatic glands*, especially of the neck. The gland or glands may first become enlarged, either from an attack of acute inflammation, or from an indolent and painless deposit of tubercle. They may remain in this state either stationary or slowly enlarging for years, till from some accidental local irritation, or from some constitutional disturbance, they inflame and suppurate. After the discharge of the matter, the ulcerated skin usually heals with an ugly puckered cicatrix, which generally remains as a disfiguring mark through life. The local treatment consists in attempting to disperse the tumor, if it is hard and painless, by painting it with tincture of iodine, or by the application of iodine ointment. If it is soft, and likely to suppurate, the process may be facilitated by the application of warm water dressing or emollient poultices. When there is undoubted fluctuation, indicating the presence of pus or matter, it is usually regarded as the best practice to open the abscess with a narrow-bladed bistoury; but some surgeons still prefer allowing the matter to make its own

way to the surface. The necessary internal treatment is that which has been already described. The *skin*, especially behind the ears, about the mouth, nostrils, and eyelids, and on the scalp, is liable to pustular diseases of a scrofulous origin. The free use of soap and water, followed by the application of black wash or zinc ointment, and proper constitutional treatment, will generally effect a cure, except in the horrible form of scrofulous ulceration of the skin of the face known as *lupus* (q.v.). Among other well-known and very serious scrofulous affections must be mentioned *acute hydrocephalus* and *mesenteric disease*, to which special articles are devoted. There is a peculiar and very intractable form of ulceration known as the *scrofulous ulcer*, which will be noticed in the article on ULCERS. The physical, chemical, and microscopical characters of the peculiar morbid deposit, to which reference has frequently been made in this article, will be found under the head of TUBERCLE.

SCROLL, an ornament of very common use in all styles of architecture. It consists of a band arranged in convolutions, like the end of a piece of paper rolled up.

SCROPHULARIACEÆ, or SCROPHULARI'NEÆ, a natural order of exogenous plants, consisting chiefly of herbaceous and half-shrubby plants. The calyx is inferior, persistent, divided into five (sometimes four) unequal divisions. The corolla is monopetalous, more or less irregular, often two-lipped, exhibiting great variety of form; in the bud it has five (sometimes four) segments. The stamens are usually four, two long and two short, sometimes two, rarely five. The ovary is two-celled, with many ovules; the style simple, the stigma generally two-lobed. The lobes of the stigma sometimes display much irritability. The fruit is a capsule, or rarely a berry.

SCRUPLE (Lat. *scrupulum*, *seriphum*, or *serupulum*) was the lowest denomination of weight among the Romans, and with them denoted the 24th part of an ounce (*uncia*), or the 288th of a pound (*libra*). As a measure of surface it was also the 24th part of the *uncia*, and the 288th of an acre (*jugerum*); seeming, in fact, to be the 24th of the 12th part of any unit. In later Roman times it became the name of the 60th part of an hour, and corresponded to our "minute." The "minute" being the *scrupulum*, the 60th part of a minute was called a *scrupulum secundum* (whence the derivation of our word "second"), the 60th part of this a *scrupulum tertium*, and so on. Lexicographers define "scrupulum" to be a small pebble, such as would be likely to find its way between the sandal and the foot, whence the use of the term to signify a small difficulty or objection. —The term at the present time is a denomination in that modification of Troy weight which is used by apothecaries; it contains 20 Troy grains, is the third part of a drachm, the 24th of an ounce, and the 288th of a Troy pound.

SCRUTIN DE LISTE, and **SCRUTIN D'ARRONDISSEMENT**. To understand these terms, prominent in recent French history, it is to be borne in mind that France is for political purposes divided into 89 departments, subdivided into 373 arrondissements which are subject to still further subdivisions into cantons and communes. By the method known as *Scrutin d'arrondissement* each arrondissement returns one deputy as its representative to the chamber of deputies in Paris, and the fullest scope is thus given to local influences and to the pressure which the individual character and resources of the candidate can exert upon the voters. By the *Scrutin de liste*, on the other hand, all the deputies of the arrondissements included in any one department are voted for by all the voters of that department, each voter casting his ballot for a list of as many candidates as the department is entitled to deputies, a plan which would of course tend to destroy the influence of minorities, and thus multiply the chances for political control by party managers. The difference between the two systems may be closely paralleled by the difference in our own methods of electing representatives to congress and of electing presidential electors. *Scrutin de liste* was the ('85-'89) legal method in French elections. See **POLITICAL PARTIES, FRENCH**.

SCUDDER, HENRY MARTYN, M.D., D.D., b. Panditeripo, Ceylon, 1822; son of the Rev. John S., a missionary. He came to the U. S., 1832; graduated from the univ. of the City of New York, and from Union theol. sem.; was ordained by the Third presbytery of N. Y., and sent as missionary to Madras. Here, in addition to his regular work, he commenced the study of medicine, and after graduating, opened a hospital and dispensary, which are still in successful operation. He returned to the U. S., 1864; was a pastor in N. J. and in San Francisco; 1871-'82 was pastor of the Central Cong. church, Brooklyn; pastor of Plymouth church (Cong.), Chicago, 1882-'87, resigning to devote himself to independent missionary work in Japan. Died 1895.

SCUDDER, HORACE ELISHA, b. Boston, 1838; graduate of Williams college, 1858; resident of New York city, 1875; at present residing in Cambridge, Mass. He has contributed to a number of quarterlies and reviews, and edited the *Riverside Magazine*, for young people. He is author of *Seven Little People and their Friends*, 1862-'63; *Dream Children*; *Life and Letters of David Coit Scudder*; *The Dwellers in Five-Sisters' Court* (1876); *The Bodley Family*, a juvenile series (1875-'83); *Noah Webster* (1882); *Men and Letters* (1888), etc. He was editor of the *Atlantic Monthly*, 1890-'96.

SCUDDER, JOHN, 1793-1885; b. New Brunswick, N. J. He gave up a medical practice in New York, and the position of house surgeon of the city hospital, to go as a missionary physician to India. He reached his field of labor in Ceylon early in 1820. He was zealous in proclaiming the gospel to the heathen, and was ordained to the min-

istry by his brethren of the mission soon after his arrival. In 1839 he was removed to Madras as associate of Mr. Winslow. In 1842 he visited the United States and labored zealously in the churches to awaken interest in the heathen, especially among the young. He returned to Madras, and when on his way to America for the second time on account of ill health he died at the cape of Good Hope. His seven sons devoted themselves to the missionary work in Arcot. This family belonged to the Reformed (Dutch) church, which formerly conducted its foreign missions in connection with the American Board (Congregational).

SCUDÉRY, MADELEINE DE, a once notable French novelist, was born at Havre in 1607. Left an orphan at the age of six, she, along with a brother named Georges, was carefully educated by one of her uncles. While still young, she left Normandy for Paris, was admitted to the hotel Rambouillet (see RAMBOUILLET), and soon became one of the oracles of the brilliant society that assembled there. It was in this famous but showy circle that Mlle. Scudéry gathered that immense fund of watery sentimentalism, platonic gallantries, "polished" conversation, dull ceremonial incidents, affectations of moral purism, etc., which make up the tedious contents of her romances—*romans de longue haleine* (long-winded romances), as they have been felicitously nicknamed. Their popularity for a brief period was painfully wide. Everybody with the slightest pretensions to "taste," except the Port-royalists, Bossuet, and a few critics of the stricter sort, professed a boundless admiration for them. The bishops in general—as Camus, Mascaron, Huet, Godeau, Fléchier, Massillon—were in raptures, and studied the stately trash with an ardor that considerably diminishes our respect for their understanding. When the troubles of the Fronde had broken up the gatherings at the hotel Rambouillet, Mlle. Scudéry organized a literary circle of her own, which met every Saturday at her house in the Rue de Beauce. These "Saturdays" began very well; but gradually they degenerated and became ridiculous—pedantic and blue-stock-ingish they had been from the very first. Nothing further in Mlle. Scudéry's life calls for notice. She died at Paris, June 2, 1701, at the advanced age of 94, honored and respected to the last; and it is but fair to admit that she seems to have been worthy of the regard in which she was held, being herself a perfect pattern of those watery virtues and superfine excellences of demeanor that she loved to depict. Her principal works (never again to be read in this world) are: *Ibrahim, ou l'Illustre Bassa* (Par. 4 vols. 1641); *Artamène, ou le Grand Cyrus* (Par. 10 vols. 1649–53); *Clélie, Histoire Romaine* (Par. 10 vols. 1656); *Almahide, ou l'Esclave Reine*, (Par. 8 vols. 1660); *Les Femmes Illustres, ou les Harangues Héroïques* (Par. 1665); 10 vols. of *Conversations Nouvelles, Conversations Morales*, and *Entretiens de Morale* (1680–92); besides *Lettres*, and *Poésies légères*, etc.—See Victor Cousin's *La Société Française au Dix septième Siècle*.

SCUDO (Ital. shield), an Italian silver coin, corresponding to the Spanish *piaster* (q.v.) the American dollar (q.v.), and the English crown (q.v.). It was so called from its bearing the heraldic shield of the prince by whose authority it was struck, and differed in value in the different states of Italy. In Rome, where it was called the *scudo Romano* or *scudo nuovo* it was equal to one dollar; and was subdivided into 10 *paoli* or 100 *bajocchi*. The Venetian scudo, or *scudo della croce*, was of higher value than the Roman one; while, on the other hand, the old scudi of Bologna, Genoa, and Modena are inferior to it in value. Scudi are now gradually disappearing from the provinces of the kingdom of Italy before the new decimal coinage, but the name is sometimes given to the piece of 5 lire, equivalent to a 5 franc piece in the French coinage. Scudi of gold were also struck in Rome, the *scudo d'oro* being equivalent to 10 *scudi di argento*. See **PIASTRE**.

SCULL—SCULLING. A scull differs from an oar in size only. It is shorter, and less heavy. A man can only manage one oar; but he can pull with a pair of sculls, the ends of which lap over very little, or else do not meet, within the boat.

Sculling has two senses, a river sense and a sea sense. In its fresh-water acceptation, sculling is the act of propelling a boat by means of sculls in pairs. Among sea-faring men, however, to scull is to drive a boat onward with one oar, worked like a screw over the stern.

SCULPIN. See **BULLHEAD**.

SCULPTURE, the process of graving or cutting hard materials; from the Lat. *sculpo*, in Gr. *glypho*. Its common application is to artistic carving or cutting. Sculpture is the art of expressing ideas or images in solid materials. In this sense processes which do not, strictly speaking, involve the cutting of hard substances are included in the term. Sculpture, as an art, includes the molding of soft materials as well. Clay, and even wax, have been in all ages of the art employed, sometimes for the purpose of sketches or models for reproduction in marble or metal, sometimes as the material of the finished work. The art of sculpture is as old as any that has been handed down to us. The Scriptures allude to the working of brass and other metals in the beginning of human society, and we read of the images of Laban carried off by his daughter. The great nations of antiquity all practiced it, though only Nineveh and Egypt have left us anything like a fair representation of the state of the art in those early times. From the nature of this art its productions have proved more durable than those of painting, and

have come down to us in more numerous instances even than works of architecture. While the latter have been destroyed, and their materials used up, works of sculpture, being smaller, have remained buried, and from time to time have been reproduced for the instruction and enjoyment of modern nations.

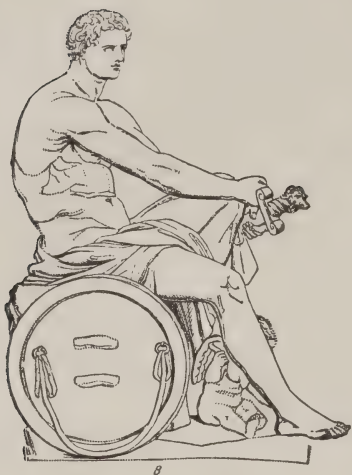
As an art, or means of recording facts and representing ideas, sculpture has many disadvantages as compared with painting, neither color nor picturesque backgrounds being properly admissible in sculpture. To this rule, however, we shall find exceptions in the works of Ghiberti in the 15th century.

Sculptures are distinguished by different terms, according to the nature and completeness of the work. Groups or figures completely represented are said to be "in the round." Those only partially detached from the mass or background are said to be "in relief." This, again, is called "high" or "low relief," according as the figure stands fully or slightly above the mass behind it. The ancient Egyptians employed another kind of relief, their figures being sunk below the surface, and only the prominent portions remaining level with it. In this case the background or unoccupied space is not cut away, but the figures are worked downward into it. Another process is called "intaglio," the whole figure being regularly designed and molded, but "cut into" the material and inverted. This is usually applied to the making of gems and seals. Another sculptural process is that used in the treatment of metals. As metals are both harder than stone and more valuable, it is not possible to cut or grave works out of masses of metal as is done in stone or gems. The metal is fused by heat, and the form is given it while in that state. This is done by first forming or molding the design in clay or other soft material. Round the model thus formed a mold is formed of sand, which is prepared and pressed round it in a wet state till it takes the complete form of the model, which is then removed, and the liquefied metal poured in. It takes the exact shape of the model by this means. These are said to be "cast," because of the casting of the liquid metal into the mold. Other processes, however, have in the finer works to be applied. The metal retains the rough surface of the sand in which it has chilled. It is therefore worked over with a graving tool to give it a final surface, and express every delicacy of form intended by the artist. In some cases this "engraving" is in the form of ornamental design, such as dress, etc. Sometimes the whole design is engraved without any previous casting. In this case the metal has had its form given by "hammering" or "beating." The metal, hot in the case of iron or bronze, or cold in the case of silver and gold, softer metals, is beaten on the anvil into its form. A coarser and deeper method of engraving is called "chasing," where deeper sinkings and bolder prominence are given to the different parts of the design.

Of molding we have already spoken. We may now remark on the materials in use for these various purposes. In sculpturing, or cutting designs or figures, we generally find marbles have been employed, the most famous having been the "Parian," from the isle of Paros, and the Pentelic, from the mountain of that name in Attica. Besides these, the ancients used numerous marbles—white, and latterly colored; the late classical sculptors sometimes employing both white and black, or colored, in lumps on the same work, the colored marble being used for the dress or hair as it might be. The Egyptians, besides the use of these materials and various kinds of fine and coarse-grained stone, employed porphyry, purple and black, an exceedingly hard and difficult material to handle. The modern sculptors have used the white marble of Carrara in Italy, an excellent material, but liable to veins and discolorations, which are unfavorable to the art. "Terra cotta," or burnt clay, was extensively in use both in ancient and modern times; the clay being molded to the utmost delicacy while soft and then baked to a red color. Singularly fine reliefs remain to us from the Etruscans and Greeks, as well as from Egypt and elsewhere, as may be seen in the British museum. It has also been extensively used in modern times. The Egyptians modeled little figures in porcelain clay, and colored and enameled them after the fashion of porcelain, and vast numbers of such are in most of our museums. The word "toreutic," from the Greek word *toreuo*, to pierce or bore, is usually applied to sculpture in metal. For this the metal most appropriate and most generally used both in ancient and modern times, is "bronze," a mixture of copper and tin. It is also known as "brass." Other metals, in small quantities, were also introduced, and various kinds of bronze have resulted from this variety, as well as from the proportions of the two principal metals, the method of fusion, etc. Egina, Delos, and Corinth made different kinds of bronze, each of excellent quality. Besides this favorite metal, gold, silver, copper, and even lead, and mixtures of lead and tin, "pewter," have been used for artistic sculpture. In the celebrated period of Greek sculpture, gold and ivory were used together. These statues, two of which were made by Phidias, were called "chryselephantine," that is, of gold and ivory.

The ordinary modes of proceeding in sculpture have been very various; whether the more celebrated sculptors of ancient times cut out their designs at once without the previous rehearsal of a model, we do not know. It is, however, very probable. The Egyptian bas-reliefs may still be seen in some of their tombs, lined out, and corrected afterward by a master's hand previous to execution. Michael Angelo, the most powerful of modern sculptors, is known to have worked many of his statues, without

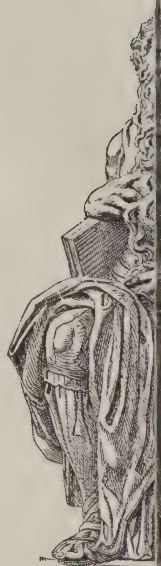
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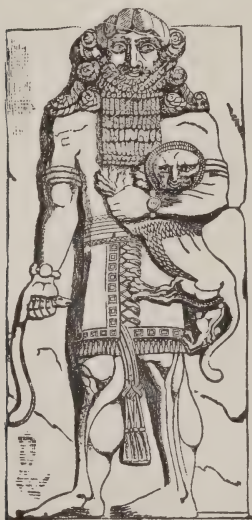
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SCULPTURE.—1. Egyptian relief from Damanhur. 2. Assyrian bas-relief. Greek: 3. From the Parthenon pediment (Phidias); 6. Apollo Belvedere; 7. Hercules-torso (Apollonios). Romance: 11. Moses (Michael Angelo); 12. Virgin Mary (Veit Stoss); 13. Statue of Vischnu. 15. Antinous (Thorwaldsen.)



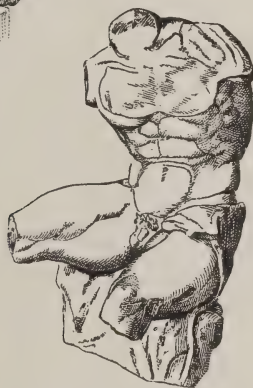
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Marpy monument at Xanthos; 4. From the Parthenon frieze (Phidias); 5. From the
1: 8. Mars (portrait statue, villa Ludovisi); 9. Caracalla; 10. Agrippina. Renais-
y himself (at Nuremburg); 14. From the Baptistry at Pisa (Nicola Pisano). Modern:

the use of any model, out of the blocks. Florence and the Louvre (Paris), contain marble sketches or unfinished figures thus roughed out. The length and size of the chisel-marks show how boldly this great master went to work to within one-eighth of an inch of his final surface. As, however, there can be no putting on of any of the substance of stone once reduced by inadvertence, the artist commonly makes his sketch or design, in small, in clay. This is subsequently enlarged and then studied from "the life," that is, men, horses, draperies, etc., the most suitable to the artist's present purpose are selected, and with these before him he corrects his design and perfects it while the material is soft. A mold is then taken, as in the case already described, and with a plaster instead of a metal cast before him, the artist proceeds to work on his marble. The cast being placed on one block and the marble on one precisely similar, workmen proceed to place a needle on a measuring-rod, the rod resting against the block till it touches a point of the cast. The needle is then applied to the block on which the marble stands, and this is bored into till the needle touches it as it did the cast. In this way the distances of the various surfaces of the future figure from the outside of the unshaped marble are ascertained, and the workmen rough out the figure down to those measurements. The sculptor then gives the final and delicate touches that finish it himself. Finally, it is brought smooth with pumice-stone or sand. Michael Angelo and some of the ancients actually polished their statues. This, however, is generally objected to, as the sharp points of reflected light injure the general effect of the form.

We must notice one other question relative to sculpture before proceeding to a short review of the art historically, that is color. The ancients—that is, Egyptians, Ninevites, and others—did color their statues, intending, probably, to do so up to "life"—that is, to a direct imitation. The Greeks, too, employed color on their statues, certainly on their architecture. To what extent they colored their statues, is not very easy to determine. Partly, indeed, time has so altered, and partly so obliterated the coloring material, that we can only form an approximate judgment. It seems probable that the coloring was conventional, that is, that color was used to add to the splendor and distant effect of the work, rather than to attempt any positive imitation of real life. A head in the Elgin room of the British museum has been colored, the hair full red. The eyes are completely cut out, so as to show dark and shadowy hollows, even with the face colored. Gilding, too, was used for the hair. Color was extensively used in the middle ages. Many, if not most, interior sculptures were colored during that period. Quite in our own days Mr. Gibson has colored female statues. It is open to doubt whether they can be called successful as far as the color goes. Other means, however, were used to give color in late classic times, as may be seen in the Vatican, where a bust retains both enameled eyes and black eyelashes inserted into the marble. To the mixture of marbles to obtain the effect of color we have already alluded.

Speaking of sculpture generally, we may say that a great deal has come down to us. Of the best work known, that of Phidias, our readers will see notices under the head of the ELGIN MARBLES. The majority of portable works are statues. Of these, some calculations reckon as many as 60,000 of one kind and another.

Fragments of these have various terms applied to them. "Busts" are heads, or heads and chests; a "torso" is a figure without head or limbs. These are perhaps fragments. Horace, however, is supposed to allude to a recognized form of such pieces of sculpture in the words "*mediam minervam*." Statues are called "terminal" when they consist of a head only made out, the body being represented by a square post. These were set up as boundary marks, to invoke favorite deities for the owner's prosperity, and hence the name "terminal."

We now proceed to a very summary survey of the history of sculpture. We have said that ancient nations, both of profane and sacred history, were well used to sculpture. Of these, the Egyptian and Ninevite are best known. The Egyptian sculpture goes back as far as 1700, or even, in the case of the pyramids, to 2,000 years before Christ (Gardner Wilkinson, *Ancient Egyptians*). Both sculptured the human form, the Egyptians with most knowledge and refinement; both were restricted by religious traditions from arriving at a full representation of the human form; both used mixed forms of man-headed bulls, or man-headed and ram-headed lions. Usually these were colossal. The Egyptians, besides this, covered the walls of their sepulchres and temples with spirited and amply detailed historical representations.

The next great nation of whose productions we can judge was the Etruscan. They were of Greek origin. There is a great oriental influence or character in their work. It is also to some extent conventional, but often full of sublimity, and the figure quite correct in outline. This also is illustrated by their pottery, covered with figure designs, of which great abundance has been excavated in various parts of Italy. All these schools, including the Etruscan, are stiff and dry in execution—that is, wanting in the ease, fullness, and movement of the human form. They are called "archaic," meaning by that term unformed and undeveloped, belonging to an age uninstructed in technical knowledge.

Beginning with the early Egyptian times, this first period, called archaic, may be concluded with those of the Etruscans, and brings us down to about 600 B.C. From this time a rapid growth in the art took place; schools were formed in the great cities of Greece, Sicily, Egina, and Corinth; and we read of Callon, Onatas, Glaucias, and other

names, culminating in Ageladas of Argos. These men sculptured on a colossal scale, and we have already alluded to the bronze for which the Greek cities had long been famous. These schools produced the famous works known as the Egina marbles, found in 1812, as well as those of Selinus, in Sicily. Casts of the former may be seen in the British museum. The originals are at Munich.

The great period of sculpture began about 484, when Phidias was born. Ageladas was his master, as also of Polycletus and Myron, of whose works copies are now in the Vatican and elsewhere, made by Greek artists in the times of the Roman empire.

Of the great work of Phidias we will not here treat, as it is described elsewhere. Pericles did much to encourage the arts both of sculpture and painting.

For a century and a half, or for two, sculpture continued very slowly to decline. This great school ended in Praxiteles, a sculptor of consummate powers. He carried the representation of the human form further than Phidias and his scholars, and draperies in his hands lost their severer character, and clung to the rounded limbs, which they no longer concealed. His work may be seen in the casts of the Nike Apteros, or sculptures of the temple of unwinged Victory, in the British and other museums. He is said to have been the first to represent the female form quite nude, and to have contributed by such sculptures to the enervation and gradual sensualizing of the art.

During the 5th and 4th centuries B.C., we have Agoracritus of Paros; Alcamenes of Athens; Scopas, the author of the famous Niobe group now at Florence; Lysippus of Sicyon, the favorite of Alexander; Chares, the author of the famous Colossus of Rhodes; Agasias, who sculptured the "Fighting Gladiator;" Glycon of the Farnese Hercules; and many others. See *Perry's Greek and Roman Sculpture* (1882).

The Roman conquest of Corinth under Mummius in the 2d c., and afterward of Athens, brought this old art to an end. Thenceforth Greek artists were found all over the Roman empire, and the famous works of these former sculptors were reproduced by them for their new masters. The Roman sculpture, indeed, is included in this phase of Greek art—the last remarkable work that we shall notice of classic times being the famous column of Trajan, in the early part of the 2d c. A.D. This is, in fact, a tower over 100 ft. high, of white marble, entirely covered with bas-reliefs representing the Dacian wars of Trajan. We here see the expiring effort of classic art. Skillful and correct as the design is, it is, as a whole, graceless, stiff, and without beauty, compared with the old work.

Constantine, in the 4th c. of our era, carried off to Byzantium, his new seat of government, all the sculpture he could remove.

The art revived in Italy. As early as the 10th c., sculpture exhibited both design and grandeur, though wholly different from that of older times. Absolute freedom from old conventionalities, vigor, dignity, and child-like freshness of mind, distinguishes modern sculpture down to the 15th century. The most noted names we will mention here are those of Niccolo of Pisa, in the 13th c., who executed the bas-reliefs at Orvieto; after him, his son Giovanni. Andrea Pisano made one of the bronze gates of the baptistry of Florence. Ghiberti, the author of the more famous doors of the same baptistry, is next to be named; then Donato di Betto Bardi, or Donatello. Some of his works are in the church of Or San Michele, which the famous Orcagna, sculptor, painter, and architect, had built and decorated.

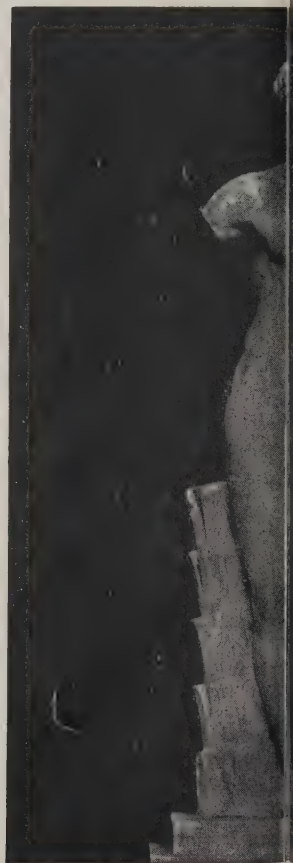
We begin the next period with Verocchio, in the 15th c., and the more famous Michael Angelo in the 16th. A host of great names followed: Cellini, Torregiano (who made the monument of Henry VII. at Westminster), Della Porta, Giovanni di Bologna, and Luca della Robbia, who also worked in enamelled terra-cotta on a large scale. These are Italian names. We may add Jean Goujon and Germain Pilon in France. In our own country, splendid mediæval works are to be seen in the noble sculptures of Wells's cathedral, and of that of Lincoln, coeval with those of the Pisani. Cibber, who sculptured in England, was a Dane; Thorwaldsen, a native of Iceland; Canova, an Italian; and lastly, Flaxman, bring us down to our own days. Of the latter, the finest work is perhaps the Wellington shield, after the Homeric description of that of Achilles. See the works of Winckelmann and Kugler, Westmacott's *Handbook of Sculpture*; and the article *ARCHÆOLOGY*.

SCULPTURED STONES. In Norway, Denmark, the Isle of Man, Wales, Ireland, and Scotland, a class of monuments is to be found decorated with rude sculpture, and belonging to the early periods of Christianity—sometimes, indeed, showing the symbols of paganism in conjunction with those of Christianity. By far the most remarkable stones of this description are those found in Scotland, which, with some points common to them with the rest, possess the distinguishing feature of a class of characters or symbols of mysterious origin, whose meaning yet remains an enigma to antiquaries, and which yet recur with such constancy in different combinations that it is impossible to suppose their form to be the work of chance. Along with these symbols the figure of the cross is often found on one side. Neither in Ireland, in Wales, nor anywhere else, are the symbols in question to be met with. These monuments all occur within a circumscribed part of Scotland. None are to be found either within the ancient Dalriada, or s. of the Forth; their limit seems to be the eastern lowlands from Dunrobin to Largo Law, or the part of Scotland inhabited by the Pictish race. From 150 to 200 of them are known to exist. The most interesting as well as the most numerous specimens are

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in Strathmore, at Glamis, Meigle, and Aberlemno. Among the various theories which have been formed regarding these stones, one is, that they were boundary stones, the cross denoting the possession of the church, and the mysterious figures having reference to the lay lord; but those antiquaries who have devoted most attention to the subject, including Mr. John Stuart, have come to the conclusion that they are sepulchral. The practice of erecting stones to commemorate deceased persons of note, existed in Scotland in pagan times, and, like other pagan practices, it was turned to Christian purposes by the earliest preachers of Christianity. Most of these monuments are of unhewn stone, and more or less oblong in shape; a very few have the form of a cross. A sculptured cross is met with on about half of them, the class without crosses belonging chiefly to Aberdeenshire, though a few of them are to be found in the country n. of Spey. Among the symbols to which we have alluded, one of the most frequent, which has been likened to the letter Z, consists of a diagonal line, from whose extremities are drawn two parallel lines terminating in some sort of ornament. This Z symbol is often traversed with what has been called the *spectacle ornament*, consisting of two circles decorated within with foliated lines, and united by two reversed curves, or occasionally intertwined with a serpent. Another prevalent symbol is a crescent, sometimes appearing by itself, more frequently with two lines drawn through it, diverging diagonally from a point below its center, and terminating in a floral or other ornament. A mirror and comb, a horse-shoe arch, a fish, and a figure like a fibula, are also all occasionally met with. Similar devices to the above have been found engraved on certain silver ornaments discovered on Norrie's Law, including a figure occurring on the Dunnichen stone, which had been taken by ingenious theorists for the high cap of the Egyptian Osiris, surmounted by a lotus, but which, as engraved on one of those silver relics, appears to be the head of a dog or some other animal.

The earlier of the Scottish sculptured stones, such as the Maiden stone in Aberdeenshire, and the older of the stones at Aberlemno, have no sculptures except of the class above described; the later combine these with devices of a more intelligible kind. An elephant is not unfrequent, represented in such a fashion, that it is obvious that the artist could never have seen one; and fabulous and grotesque figures abound, often drawn with considerable spirit. We have centaurs, lions, leopards, deer, beasts of chase, men shooting with a bow and arrow, men devoured by animals, processions with men and oxen, and priests in their robes with books. Many of these figures are highly interesting illustrations of the manners, customs, and dress of the period. On a stone near Glamis is a man with a crocodile's head. On the cross at St. Vigeans, a hybrid, half-bird half-beast, appears in the midst of a border of entwining snakes and fantastic creatures. A stone of great interest at Meigle contains a representation of a chariot. At Farnell is a group of figures that seems to be meant for the temptation. In but two instances have inscriptions been known to accompany these sculptures; in the one case the letters are so worn away as to be undecipherable; in the other instance, at St. Vigeans, a few letters can be traced of the same Celtic character which has been found on the earliest Irish monuments and the oldest tombs at Iona.

The general style of ornamentation of these stones, judging by a comparison with Anglo-Saxon illuminated MSS., has led to the conclusion that they were erected in the 8th or 9th c., a period when Christianity had but lately supplanted paganism among the Scottish Picts.

A stone differing in character from those described, now erected near the house of Newton in Aberdeenshire, in the same neighborhood in which it was found, has been a notable puzzle to archæologists. It is not sculptured, but inscribed in a character which seems unique. Besides the principal inscription, there is another running along the edge, consisting of groups of short lines, and apparently in the Ogham (q.v.) character.

The crosses in Ireland are the likeliest to these Scottish monuments. They are chiefly found near churches and graveyards, and are generally cruciform, with a halo or circle binding the arms and stem together. They usually taper to the top, on which a conical capstone is fixed, and they are inserted in pedestals of stone, which are frequently covered with sculpture. Most of their subjects are from Scripture history, without anything like the Scotch symbols.

The Welsh crosses are, for the most part, in the form of a small cross within a circle, set on the top of a long shaft, the latter having at times interlaced ornaments in compartments. Many of them have inscriptions in the Romano-British character, relating to the persons in memory of whom they were erected.

The sculptured crosses of Scandinavia and Man somewhat resemble the Scotch monuments in their general style of ornamentation, though altogether destitute of the peculiar Scottish symbols. On some of them are Runic inscriptions. One inscription on a Manx cross indicates that Gaut (probably a Norwegian) made this cross and all on Man. Another is to the effect that ——— erected this cross to his father Ufag, but Gaut Bjornson made it. Professor Munch, from the character of the runes on these crosses, assigns them for date the middle or end of the 11th century. See RUNES.

A hundred and fifty of the sculptured stones of Scotland have been carefully engraved and described in a very valuable work contributed to the Spalding club by Mr. John Stuart.

SCUP, or SCUPPAUG. See PORGY.

SCUPPERS are holes, lined with lead, in a ship's side, intended to carry off rain or other water which may be shipped.

SCURRY, a co. in n.w. Texas; formed 1876; organized 1884; area, 900 sq. m. Pop. '90, 1415. Co. seat, Snyder.

SCURVY, or SCORBU'TUS, is a disease which is characterized by a depraved condition of the blood. In consequence of this morbid state of the blood, there is great debility of the system at large, with a tendency to congestion, hemorrhage, etc., in various parts of the body, and especially in the gums. It is a disease that has probably existed from the earliest times, but the first distinct account of it is contained in the history of the crusade of Louis IX., in the 13th c., against the Saracens of Egypt, during which the French army suffered greatly from it. In the 16th c. it prevailed endemically in various parts of the n. of Europe, and it seems only to have abated about a century ago. It was in badly fed armies, in besieged cities, and on board ship, that its ravages were most appalling, and it is believed that more seamen perished from scurvy alone than from all other causes combined, whether sickness, tempest, or battle. Whole crews were prostrated by this scourge, as in the well-known case of lord Anson's memorable voyage.

Scurvy so closely resembles purpura in its general symptoms that it will be sufficient for us to refer to the article on that disease, and here merely to indicate the leading points of difference between the two diseases, which, notwithstanding their similarity, are essentially different. Scurvy is caused by a privation, for a considerable time, of fresh succulent vegetables, while purpura often makes its appearance when there has been no deficiency of this food, or special abstinence from it. Scurvy is most common in winter or the early spring, while summer and autumn are the seasons for purpura. In scurvy the gums are invariably swelled and spongy, and bleed readily; in purpura this is not necessarily the case. In scurvy there is extreme debility and depression of spirits, venesection and mercury do positive harm, while a cure is rapidly effected by the administration of lemon-juice, or of fresh fruits and vegetables; whereas in purpura there is little or no mental or bodily depression, venesection and mercury often give relief, while no marked and certain relief follows the administration of the lemon-juice and fruits that are all-powerful in scurvy.

Although the virtues of lemon-juice in scurvy were known in Gt. Britain as far back as 1636, when John Woodhall, master in surgery, published *The Surgeon's Mate, or Military and Domestic Medicine*, this invaluable medicine was not made an essential element of nautical diet till 1795. The effect of this official act may be estimated from the following numbers. In 1780 the number of cases of scurvy received into Hasler hospital (a purely naval hospital) was 1457, while in 1806 there was only one case, and in 1807 only one case. Many naval surgeons of the present day have never seen a case of the disease. The potato possesses almost equally great antiscorbutic properties, and, fortunately, potatoes when cooked are as active as when taken raw. The late Dr. Baly, to whom we are indebted for this discovery, states that "in several prisons the occurrence of scurvy has wholly ceased on the addition of a few pounds of potatoes being made to the weekly dietary." The salutary action of potatoes is probably owing to their containing a considerable amount of tartaric acid, partly in combination with potash and lime, and partly free. In addition to the dietetic treatment, which should include easily digested animal food, potatoes, such ripe fruits as can be procured, and an abundance of lemonade, little further need be prescribed. If necessary, constipation must be relieved by mild laxatives, such as rhubarb and castor-oil; the appetite may be stimulated by bitter tonics, and opiates given to procure rest in case of pain or obstinate wakefulness. When the gums are very troublesome, solutions of tannin, chloride of lime, or of nitrate of silver, may be applied to them. A varied food scale is now held to be very effective combined with sanitary precautions.

SCURVY-GRASS, *Cochlearia*, a genus of plants of the natural order *crucifera* (q.v.), having small white flowers, and many-seeded pouches; the cotyledons accumbent. The species are annual or biennial, rarely perennial, plants; of humble growth, with branched smooth stems, smooth simple leaves, and terminal racemes of flowers. They have an acrid biting taste, containing the same pungent volatile oil which is found in horse-radish, and are valued for their antiscorbutic properties. COMMON SCURVY-GRASS (*C. officinalis*) is sometimes a foot high; the root-leaves are stalked and heart-shaped; the pouches globose, ovate, or elliptical. It is a variable plant, and some of the other species described by botanists are probably not essentially different. They possess the same properties. Scurvy-grass is very common on the shores of Britain, growing both on rocks where there is little soil, and in muddy places. It is also found on high mountains. It is a very widely distributed plant, and being found on the shores of almost all parts of the world, has often been of the greatest benefit to sailors, in times when the modern precautions against sea scurvy were unknown.

SCU TAGE, or ESCUAGE (Lat. *scutum*, shield), a pecuniary fine or tax sometimes levied by the crown, in feudal times, as a substitute for the personal service of the vassal. No scutage seems at any time to have been levied in Scotland.

SCUTARI (Italian or Levantine form of the Turkish *Usküdar*), a t. of Asia Minor on the eastern shore of the Bosphorus, immediately opposite Constantinople, of which it may be considered a suburb. It is built on the sides and summit of a hill, sloping irregularly upward from the water's edge, and bears, both externally and internally, a great resemblance to the Turkish capital. It contains several mosques, bazaars, and baths, colleges and schools, manufactories of silks, cotton fabrics, and leather, and corn warehouses. It has long been famed for its extensive cemeteries, adorned with magnificent cypresses, the chosen resting-place of many of the Turks of Constantinople, from attachment to the sacred soil of Asia, and the traditionary belief that their race will one day be driven out of Europe. The population is variously estimated at from 35,000 to 75,000. This town accidentally acquired great notoriety in connection with the English army during the Russian war (1854-56), when the enormous barracks built by sultan Mahmud, on the southern outskirts of the town, were occupied as barracks and hospital by the English troops, and formed the scene of Miss Nightingale's labors. A little to the s. of the general hospital, on the cliffs bordering the sea of Marmora, is the densely-filled English burial ground, where baron Marochetti's monument in honor of the troops has lately been erected.—Scutari is a place of considerable traffic, and is the rendezvous and starting-point of caravans and travelers trading with the interior of Asia. It occupies the site of the ancient *Chrysopolis*; and about 2 m. to the s. lies the village of Kadiköi, the ancient *Chalcedon*.

SCUTARI (Turkish *Iskandere*, the anc. *Scodra*), a considerable t. of European Turkey, in northern Albania, capital of a vilayet of the same name, situated at the southern end of the lake of Scutari, at the point where the Bojana, issuing from it, is joined by the Drinassi. The lake is about 27 m. long, and abounds in fish. Scutari is a fortified town, with a citadel on a commanding height. It has some manufactories, a bazaar, and yards for building coasting-vessels. It carries on a considerable trade. The population is estimated at from 36,000 to 50,000.

SCUTCH'EON, in carpentry, is the small metal plate used to form the protection and ornament to the keyhole for locks; it is usually of brass, but in ornamental cabinet-work, is often of ivory, mother of pearl, etc. See **SHIELD**.

SCYLLA AND **CHARYBDIS**. Scylla (Gr. *Skullaion*), a rocky cape on the w. coast of s. Italy, jutting out boldly into the sea so as to form a small peninsula just at the northern entrance to the straits of Messina. About the beginning of the 5th c. (B.C.), a fort was built upon the rock (which is about 200 ft. high, and much hollowed out below by the action of the waves), and in course of time a small town grew up, straggling down the slopes toward the sea. The navigation at this place was looked upon by the ancients as attended with immense danger, which, however, seems to have been much exaggerated, for at the present day the risk is not more than attends the doubling of any ordinary cape. The rock, according to the Homeric legend, was the abode of a monster called Scylla, possessing 12 feet, 6 long necks and mouths, each with 3 rows of sharp teeth, and who barked like a dog. There are other accounts of Scylla, one of which represents her as having once been a beautiful maiden, beloved by the sea-god Glaucus, but who, by the jealousy of Circé, was changed into a monster having the upper part of the body that of a woman, while the lower part consisted of the tail of a fish or serpent surrounded by dogs. The modern Scilla or Sciglio is a fortified town in the province of Reggio di Calabria, having large silk-works, the pop. being upward of 5000, mostly sea-faring people.

Charybdis (modern name *Galofaro*), is a celebrated whirlpool in the straits of Messina, nearly opposite the entrance to the harbor of Messina in Sicily, and in ancient writings always mentioned in conjunction with Scylla. The navigation of this whirlpool is, even at the present day, considered to be very dangerous, and must have been exceedingly so to the open ships of the ancients. A modern writer describes it as being "an agitated water of from 70 to 90 fathoms in depth, circling in quick eddies." Homer places it immediately opposite to Scylla, probably taking advantage of the poetic license to exaggerate the danger of the navigation, although it is not improbable that the whirlpool may have changed its situation since his days. The myth connected with it is, that under a large fig-tree, which grew out of a rock opposite Scylla, dwelt the monster Charybdis, who thrice every day sucked down the water of the sea, and thrice threw it up again.

SCYTHE. See **REAPING**.

SCYTHIA, a name employed in ancient times to denote a vast, indefinite, and almost unknown territory n. and e. of the Black sea, the Caspian, and the sea of Aral. But the term is not so much *geographical* as *ethnological*, and the only interest attaching to the barren catalogue of tribes and nations, which we meet with in the classical writers, springs from the hope, of connecting these with a recognized race of modern times. Latham argues—successfully, as it appears to us—for the Scythians being the ancestors of the later *Turks*, and maintains their central and primitive abode to have been Independent Tartary, whence they spread w. round the Caspian into Russia, Transylvania

and perhaps even eastern Hungary. Niebühr and Neumann favor the hypothesis of a Mongol origin for the Scythians; while others regard them as Finns or Circassians. In their mode of life they were mainly nomadic and pastoral, though we read of some trans-Danubian and Euxine tribes that followed agriculture. Many of them were *hippemolgi* ("mare-milkers").

SCYTHOPOLIS, the biblical Bethshan or Betshean, belonging to the tribe of Manassch; 2 m. w. of the Jordan, and 12 m. s. of the sea of Galilee. The name Scythopolis is not known at the present day, but the ancient town and name are found in the modern Beisan. It was once the seat of a Christian bishop, and during the crusades, of an archbishopric. It contains now but 60 or 70 houses. Extensive ruins of the ancient city are found.

SEA, in its general signification, denotes that large expanse of salt water which covers the more depressed portion of the earth's surface, fills up each hollow and rift to a certain uniform level, completing as far as possible the sphericity of the globe, and divides its surface into two great and innumerable smaller portions—the Old and New Worlds and their islands. This immense body of water is not distributed with the least approach to regularity, but here forms a huge basin, there becomes a long and tortuous inlet or strait, which narrows or widens as the configuration of the land-surface on each side permits; nor is it placed symmetrically to the earth's axis of rotation; for the hemisphere of which the s.w. corner of England is the center or pole contains the whole of the land-surface, if we except the triangular portion of South America, s. of Uruguay, Australia, New Zealand, the most of the East Indian islands, and the land around the s. pole (of unknown extent). The other hemisphere is, with these exceptions, wholly water. From this irregular distribution of the sea over the earth's surface, and from the specific gravity of water being about $\frac{1}{4}$ of that of the land, it necessarily follows that the center of gravity of the whole globe does not correspond accurately with its center of figure. The extent of sea-surface is estimated at 144,712,850 English sq. m., or nearly $\frac{3}{4}$ of the whole of the earth's surface, and its mass, on the supposition of an average depth of 2 m., is about $\frac{1}{4000}$ of that of the whole globe; such estimates however, can be considered at best as only rough approximations. One of the most remarkable features of the sea is its continuity or oneness; for in spite of the fact that numerous large stretches of salt water, as the sea of Azof, Black, Mediterranean, and Baltic seas, the gulf of Mexico, and others, have barely avoided becoming detached lakes, very few such are found on the earth's surface; and with the exception of the Caspian and Aral seas, they are of small size.

Composition, Specific Gravity, and Temperature of the Sea.—The ocean consists of salt water, and from its continual motion, under the influence of currents and waves, preserves, generally speaking, uniform saltness. Under special circumstances, however, we find the saltness increased, as by the excess of evaporation over the fresh-water influx in the Mediterranean and Red seas, and about the northern and southern limits of the tropical belt; and decreased, by the contrary cause, in the sea of Azof, the Black sea, the Baltic sea, and in the polar regions. See **WIND**. The origin of the saltness of the sea is sufficiently accounted for when we consider that the chloride of sodium and other soluble salts which form constituent ingredients of the globe are being constantly washed out of the soil and rocks by rain and springs, and carried down by the rivers; and as the evaporation which feeds the rivers carries none of the dissolved matter back to the land, the tendency is to accumulate in the sea. The principal ingredients found in sea-water are chloride of sodium, or common salt, together with salts of magnesia and lime. A more exact analysis will be given under **WATER**. The average specific gravity of the sea, out of reach of the exceptional action of the melting of snow, rain, or river-water is (at 62° Fahr.) 1.02655. The slight variations in the saltness of the sea must necessarily produce corresponding changes in its specific gravity; accordingly, on the northern and southern limits of the torrid zone, the mean specific gravity of the sea is, in different longitudes, 1.02785, 1.0268; while at the equatorial calm belt it is 1.0252, 1.0267; and on the whole shows a tendency to diminish as the latitude increases, Beechey having found it to be 1.0258 in lats. 55° to 60° n. and s. in the Pacific, and King 1.0255 in the corresponding latitudes of the Atlantic. It is considerably diminished near the mouths of rivers, and in those inlets or semi-lacustrine arms which are the depositories of more river-water than compensates for their evaporation, as in the Black sea, where it is 1.0143, and in the Baltic, only 1.0086.

The temperature of the sea, where it is not affected by currents from a warmer or colder region, necessarily corresponds to the normal temperature of the latitude; but this is true only of the water at and near the surface, for it has been recently proved by the observations made on deep-sea temperature by Carpenter, Wyville Thomson, and others, that the temperature rapidly diminishes with the depth, particularly in tropical and temperate regions, till at great depths ice-cold water is everywhere found. Thus, from the extensive observations made by H.M.S. *Challenger* in the North Atlantic during 1873, it is shown that at the equator, where the surface temperature is about 80°, the decrease with the depth is so rapid, that at 60 fathoms from the surface the temperature is only 61°.5; at 150 fathoms it is 50°; at 700 fathoms, the temperature has fallen to 40°; at about 1600 fathoms, to 36°. Below this it diminishes at a much slower rate, till it falls nearly to

freezing at all great depths which are connected by under-currents with the Antarctic or Arctic seas. The sea-water of the upper 60 or 80 fathoms is affected by the solar heat. Immediately beneath this sun-beated upper stratum, it is remarkable that all the water in the North Atlantic, as far as lat. 40°, is warmer than that at the same depth under the equator. The mean temperature of the upper 1500 fathoms in the North Atlantic is 4°.5 warmer than the same upper stratum at the equator. As regards the temperature of the water at the bottom, at all stations between Bermuda and the equator on the e. side of the Atlantic, the temperature is remarkably uniform at 35°.2; in the bay of Biscay, to n.e. of this line, it is 1° warmer; s.w. of the same line, 1° colder; whereas, further s. at the equator, on the western side of the Atlantic, it is 32°.4, or 2°.8 colder. This last fact is of very great importance, since, from the circumstance that at the equator the bottom temperature is 32°.4, and that at all stations to n. of it the bottom temperature is warmer, it follows that the cold water at the bottom of the Atlantic as far n. as the Azores and bay of Biscay, equally with that at the equator, is derived from an Antarctic, and not from an Arctic source. This cold Antarctic current entering the North Atlantic is found between 1700 fathoms and the bottom, a total thickness of 700 fathoms. Ice-cold water has also been found at the bottom in the Arabian sea. In land-locked seas, such as the Mediterranean, whose deep water is not in communication with that of the Atlantic, owing to the shallowness of the sea at the straits of Gibraltar, the bottom temperature does not fall so low as that of the ocean. Thus the temperature of the Mediterranean at 1508 fathoms is 55°, whereas at this depth in the ocean it is so low as 36°. See ISOTHERMAL LINES. The highest surface-temperature does not correspond with the equator, but owing to the disturbing influence of currents in the following regions: Between Sumatra and the Zanzibar coast; e. of the Philippine islands, to long. 170° e.; e. of Cuba and Florida; and n.e. of cape St. Roque.

Color and Phosphorescence of the Sea.—The color of the ocean, when free from admixture of foreign substances, as animalcules, vegetable organisms, excessive rain, or the tinted waters of swollen rivers, is a pure deep blue, which becomes less marked where the water is of less depth. A "different" color of sea-water is due to the presence of some foreign substance; e.g., the red, brown, and white patches of the Pacific and Indian oceans to the presence of swarms of animalcules, and the colors of the Red and Yellow seas to matters of vegetable origin. The Rhone, at its emergence from the lake of Geneva, and the lake itself, exhibit an intensity of blue far surpassing that of any sea. The phosphorescence of the sea is due to the presence of myriads of invertebrata, especially rhizopoda, tunicata, etc. See LUMINOSITY OF ORGANIC BEINGS.

Depth of the Sea.—Till very recently, it might be said that, with the exception of the more frequented strips along the coast, and such other portions as afforded anchorage ground, our knowledge of the depth of the ocean amounted to nothing. It is true that deep-sea soundings had been frequently made, but from the necessary defectiveness of the ordinary "lead" and inattention to the effect of under-currents in destroying the perpendicularity of the line, little dependence could be placed on the results obtained. It is chiefly in the Atlantic that the new and trustworthy method of sounding (q.v.) has been practiced, and the contours of its bottom may now be considered as fairly ascertained. The greatest depth measured by the *Challenger* (in n. lat. 19° 41', w. long. 65° 7', was 3,875 fathoms, or 23,250 ft. (about 4.4 miles). Over a great extent of the area the depth ranges between 2,000 and 3,000 fathoms. Along the middle runs an irregular ridge, on which the depth is less than 2,000 fathoms, and n. of 50° a plateau of similar depth extends, with little interruption, from Ireland to Newfoundland, on which the telegraph cables are laid. Nowhere round the British isles is the sea above 400 ft. deep. In the Pacific, several tracks of soundings were obtained during the *Challenger* expedition (1873-75). From the numerous islands which stud this ocean, one might be led to assume its comparative shallowness; but this is far from being the case, for the islands rise abruptly from the bottom, and very deep soundings have been obtained near their shores. Over a great part of the area, the depth is over 2,000 fathoms; in the deeper parts, it ranges from 3,000 to over 4,000 fathoms. The deepest sounding got was 4,475 fathoms (36,850 ft. or above 5 m.), in n. lat. 11° 24', e. long. 143° 16', near the Ladrone islands. From the remarkable gentleness of slope of the bed of the Arctic ocean to the n. of Siberia, the line giving only 14 to 15 fathoms at 150 m. from the shore, and from its configuration on the n. of America, it is generally concluded to be by far the shallowest of the oceans. Of the depth of the Antarctic ocean, little is known, but it is supposed to be deeper than its antipodal kinsman. Near the Antarctic circle, s.e. from Kerguelen, the *Challenger* took a few soundings varying from 1300 to 1975 fathoms. From all that has hitherto been observed, it would seem as if the land-surface under water were the counterpart as regards eminences and hollows, chasms, valleys, plateaus, etc., of the land-surface above.

Motion of the Sea.—The sea is in a state of perpetual restlessness, its motion being either a vertical oscillation, or an actual transference of its waters from one place to another. The first motion, which constitutes *waves*, is due either to the attraction of the sun and moon on such a mobile body as the sea (see TIDES), or to the impulsive action of the winds which blow over its surface (see WAVE); the second arises from the sun, which, directly through its heat and indirectly by scorching dry winds, produces evaporation to a great extent of the parts most exposed to its influence, and by its similar action on the

atmosphere (see WIND) causes a transference of this vapor to remote latitudes, where it descends in the form of rain, and, destroying the equilibrium of the sea, gives rise to currents. The nature of these currents is described under GULF STREAM, and the chief currents of each ocean are found under its own head. This constant motion of the sea is of great service in tending to equalize the temperature of different parts of the globe; it also produces remarkable changes in the form of coasts, eating into rocks, converting low-lying lands into shoals and sand-banks, or carrying away the earthy materials, and depositing them in some distant region. The erosive action of the sea is generally almost imperceptible during several years, but in course of two or three centuries the magnitude of the changes effected by it is almost incredible.

On the economic value of the sea as a purifier, and as a commercial highway, it is unnecessary to dilate. For some of the peculiar phenomena of the sea, see ICE; WHIRLPOOL; WHIRLWIND; the five great oceans; CORAL, etc.

The term *sea* is also applied in a more limited though indefinite sense to an offshoot of one of the oceans, as to the Black, Baltic, Okhotsk seas, to any portion of an ocean which from its position or configuration is considered deserving of a special name, and to the two great inland salt lakes of central Asia, the Caspian and Aral seas.

SEA, SOVEREIGNTY OF THE. Blackstone lays it down that the main or high seas are part of the realm of England, as the courts of admiralty have jurisdiction there; but adds that they are not subject to common law. But the law of nations, as now understood, recognizes no dominion in any one nation over the high seas, which are the highway of all nations, and governed by the public law of the civilized world. Such a right has, however, long been claimed over the four seas surrounding the British isles. It was strongly asserted by Selden, and denied by Grotius, and measures were taken to vindicate the right in the reign of Charles I. Every nation has undoubtedly a right to the exclusive dominion of the sea within a certain not very well-defined distance from the shore, depending on the usage of the country. This right of lordship includes the right to free navigation, to fishing, to taking wrecks, the forbidding passage to enemies, the right of flag, of jurisdiction, etc. See BLOCKADE, NEUTRALS, MARE CLAUSUM.

SEA-ANEM'ONE. See ACTINIA.

SEA-BEAR. See OTARY.

SEABRIGHT, a borough in Monmouth co., N. J.; between Shrewsbury river and the Atlantic ocean; on the Central of New Jersey railroad; 26 miles s. of New York. It is a popular summer resort, with large hotels, pretty cottages on the ocean front, gravel roads and flagged walks, excellent sewerage, electric lights, water supply from Long Branch, town hall, several churches, and a public school. Permanent pop., about 500.

SEABURY, SAMUEL, D.D., 1729-96; b. Conn.; graduated at Yale college in 1748; studied medicine and theology in Scotland; ordained in London in 1753; pastor of churches in New Brunswick, N. J.; Jamaica, Long Island; Westchester, N. Y., 1756-75; suspected of being the author of some tory pamphlets, was imprisoned for a while in New Haven; resided during the revolutionary war mostly in New York; went to England in 1784, and was consecrated bishop of Connecticut; chosen rector of St. James's church, New London, Conn.; took part in revising the Prayer-Book and preparing the constitution for the American Episcopal church which was adopted in 1789.

SEABURY, SAMUEL, D.D., 1801-72; b. Conn.; ordained priest in the Protestant Episcopal church in 1827; was missionary on Long Island; professor of languages at Flushing institute, 1830-34; editor of *The Churchman*, 1831-49; rector of the church of the Annunciation, 1838-68; professor of biblical learning in the general theological seminary, 1862-72. He published *The Continuity of the Church of England in the 16th c.; Supremacy and Obligation of Conscience; The Theory and Use of the Church Calendar.*

SEA-CAT. See CHIMÆRA.

SEA-COW. See MANATEE, or LAMANTIN.

SEA-CUCUMBER. See HOLOTHURIA.

SEA-DEVIL. See ANGLER.

SEA-EAGLE. See ERNE.

SEA-EGG, or SEA URCHIN. See ECHINUS.

SEA-ELEPHANT. See ELEPHANT, SEA.

SEA-FAN. See GORGONIA.

SEA-FOX. See FOX-SHARK.

SEA-GRAPE, *Ephedra*, a genus of plants of the natural order *gnetaceæ*, a natural order consisting of a small number of species, closely allied in botanical characters to the *conifereæ*, and by many botanists united with that order, although differing much in appearance. The *gnetaceæ* are small trees, or twiggy shrubs, with opposite or clustered branches and jointed stems, whence they are sometimes called JOINT-FIRS. They secrete not resinous but watery matter. The development of the ovule is very peculiar; it has a projecting process formed from the intimate covering of the nucleus.

SEA HAM HARBOR, a sea-port in the co. of Durham, 5 m. s. of Sunderland. Its excellent harbor is furnished with wharfs, quays, and jetties, and the town contains bot-

le-works, blast furnaces, an iron-foundry, and chemical works. It communicates by railway with collieries in the vicinity, and the principal articles of export are coals and agricultural produce. The population of this thriving little sea-port town was, in 1891, 8856. The town has been much improved by its proprietor the Marquis of Londonderry.

SEA-HOG. See PORPOISE.

SEA-HORSE, in heraldry, a fabulous animal consisting of the upper part of a horse with webbed feet, united to the tail of a fish. A scalloped fin is carried down the back. The arms of the town of Cambridge are supported by two sea-horses proper, finned and maned or. The morse (q. v.) or walrus is often called sea-horse; as the Manatee (q. v.) is called sea-cow.

SEA-HORSE. See HIPPOGAMPUS.

SEA-HORSE or WALRUS. See MORSE.

SEA-KALE, *Crambe maritima*; see CRAMBE, a perennial plant with large roundish sinuated sea-green leaves, found on the sea-shores in various parts of Europe, and in Britain. The blanched sprouts have become a very favorite esculent in Britain, although as yet little known on the continent. The common people, on some of the shores of England, have long been in the practice of watching them when they came through the sand, and using them as a pot-herb, but the cultivation of the plant in the kitchen garden became general only at a comparatively recent date. It requires a deep rich soil, and the care of the gardener is bestowed upon the blanching, without which the sprouts are not tender and agreeable, but even acrid. The blanching is accomplished in various ways, by earth, sand, boards, earthenware pots, etc. Sea-kale is generally raised from seed, although also sometimes propagated by offsets or by cuttings of the roots. The seedlings do not yield a crop till the third year; but a plantation of sea-kale remains productive for many years. It is planted in rows, four to six feet apart. It sends its tap-root very deep into the ground.

SEAL (Lat. *sigillum*, Fr. *seau*), an impression on wax or other soft substance made from a die or matrix of metal, a gem, or some other material. The stamp which yields the impression is sometimes itself called the seal. In Egypt, seals were in use at an early period, the matrix generally forming part of a ring (see GEM, RING). Devices of a variety of sorts were in use at Rome, both by the earlier emperors and private individuals. The emperors, after the time of Constantine, introduced *bullæ* or leaden seals, and their use was continued after the fall of the western empire by the popes, who attached them to documents by cords or bands. On the earlier papal seals are monograms of the pope; afterward the great seal contained the name of the pope in full, and a cross between the heads of St. Peter and St. Paul, while the papal privy seal, impressed not on lead, but on wax, known as the *seal of the fisherman*, represented St. Peter fishing. In the 9th and 10th c. we find Charlemagne, the Byzantine emperors, and the Venetian doges, occasionally sealing with gold, and we have an instance as late as the 16th c. of a gold seal appended to the treaty of the Field of the Cloth of Gold, between Henry VIII. and Francis I.

Seals were not much used in England in Anglo-Saxon times, but they came into general use after the Norman conquest. On the royal great seals was the king in armor on a caparisoned horse galloping, his arms being shown on his shield after the period when arms came into use; and the reverse represented the king seated on a throne. The great seals of Scotland begin with Duncan II. in the end of the 11th c., and have also for subject the king on horseback; the counterseal, with the seated figure, being used first by Alexander I., and the earliest appearance of the arms of Scotland being on the seal of Alexander II. In both countries there were also the privy seals with the royal arms only.

Ecclesiastical seals first appear in the 9th c., and attained great beauty in the 13th and 14th. They are of the pointed oval form known as *vesica piscis*; and have for subjects, a figure of the bishop, sometimes of the Trinity, the Virgin, or a patron saint, seated under an elaborate architectural canopy. The arms of the bishop are often added.

Under the Norman monarchs of England, sealing became a legal formality, necessary to the authentication of a deed; and from the 13th c. onward, the seals of all persons of noble or gentle birth represented their armorial ensigns. The seal was generally appended to the document by passing a strip of parchment or a cord through a slit in its lower edge; and the ends being held together, the wax was pressed or molded round them a short distance from the extremity, and the matrix impressed on it. Occasionally the seal was not pendant, but the wax was spread on the deed. The colored wax with the impression was sometimes imbedded in a mass of white wax forming a protective border to it. In England, a seal is still an essential to all legal instruments by which real estate is conveyed; but since subscription has also become necessary, the practice of sealing has degenerated into a mere formality. The custom was gradually introduced of covering the wax with white paper, on which the impression was made, and latterly wafers have been considered a sufficient substitute for seals.

In Scotland, every freeholder was obliged by statutes of Robert III. and James I. to have his seal of arms, an impression of which was kept in the office of the clerk of court

of the shire; and among the Scottish armorial seals of the 14th and 15th centuries are some of wonderful beauty of execution. Act 1540, c. 117, for the first time made subscription an essential formality to deeds; but sealing still continued to be necessary till 1584, when it was dispensed with in the case of deeds containing a clause of registration, and soon afterwards the practice was altogether laid aside.

The use of corporate seals by towns in England dates as far back as the 12th century. The earlier corporate seals bear the town gates, city walls, or some similar device; the use of corporate arms did not begin till the latter half of the 14th century.

The principal use of seals in the present day is in closing letters, and even for this purpose they have of late years been less used than formerly; owing to the fashion of using stamped adhesive envelopes.

The study of mediæval seals is of great importance and interest in connection with many branches of archæology, including heraldic and genealogical investigations. See GREAT SEAL; PRIVY SEAL.

A seal, in law, is defined by Coke, as "wax with an impression," and such a seal was required at common law. In many of the states, a scroll, i.e., a mark or flourish with the pen has the validity of a seal. Courts take judicial notice of the seal of a notary public, and of superior courts, but not of foreign courts, except courts of maritime and admiralty jurisdiction. No proof need be made of the public seal of a foreign state, and all documents, decrees, etc., bearing such seal are presumed genuine. A contract with a seal affixed is called a specialty. The seal of the United States was adopted by congress June 20, 1782.

SEAL, *Phoca* a Linnæan genus of mammalia, now forming the family *phocidæ*, and including all that family except the morse (q.v.), or walrus. The name seal is from the Anglo-Saxon *seol*. The *Phocidæ* constitute, in Cuvier's system, a section of *carnivora* (q.v.) designated *amphibia*. Their structure is most perfectly adapted to an aquatic life, and they live chiefly in water, but spend part of their time on shore, reposing and basking in the sunshine on rocks, sand-banks, ice-fields, or beaches; and they bring forth their young on shore. The body is elongated, and tapers from the chest to the tail; the head somewhat resembles that of a dog, and in most of the species the brain is large; the feet are short, and little more than the paw projects beyond the skin of the body; all the feet are thoroughly webbed, and five-toed; the fore-feet are placed like those of other quadrupeds; but the hind-feet are directed backward, like a prolongation of the body, and between them is a short tail. The toes, particularly those of the hind-feet, are capable of being spread out very widely in swimming, so as to give great propulsive power. The movements of seals in the water are very rapid and graceful; on land, they are very peculiar; even the fore-feet being little used or not at all, but the body contracted by an upward bending of the spine, and so thrown forward by a succession of jerks; in which way, however, a seal makes its escape very rapidly from an assailant. The flexibility of the spine in seals is very remarkable, and depends on the very large intervertebral cartilages, formed of fibrous concentric rings. The muscles, which are connected with the spine on all sides, are of great strength.

The teeth differ considerably in the different genera, but in all are adapted for the seizure of slippery prey, the chief food of seals being fishes, although they do not reject other animal food, and are said even to feed in part on vegetable substances. Their incisors are either six in the upper jaw and four in the lower, or four in the upper and two in the lower; they all have large and strong canine teeth; and the molars, usually five or six on each side in each jaw, are either sharp-edged or conical, and beset with points. Seals have a remarkable habit of swallowing large stones, for which no probable reason has yet been conjectured. Their stomachs are very often found to be in part filled with stones. The stomach is quite simple; the gullet (*œsophagus*) enters it at the left extremity; the cœcum is short, the intestinal canal long.

The respiration of seals is extremely slow, about two minutes intervening between one breath and another, when the animal is on land and in full activity. A seal has been known to remain twenty-five minutes under water. Their slowness of respiration, and power of suspending it for a considerable time, is of great use, as enabling them to pursue their prey under water. The fur of seals is very smooth, and abundantly lubricated with an oily secretion. There is generally an inner coating of rich fur, through which grow long hairs, forming an outer covering. Another adaptation to aquatic life and cold climates appears in a layer of fat immediately under the skin—from which *seal oil* is obtained—serving not only for support when food is scarce, but for protection from cold, and at the same time rendering the whole body lighter. The nostrils are capable of being readily and completely closed, and are so while the seal is under water; and there is a similar provision for the ears; while the eye, which is large, exhibits remarkable peculiarities, supposed to be intended for its adaptation to use both in air and water. The face is provided with strong whiskers, connected at their base with large nerves.

Seals produce their young only once a year; sometimes one, sometimes two, at a birth. Not long after their birth, the young are conducted by the mother to the sea. Many, if not all, of the species are polygamous. Terrible fights occur among the males.

Seals are very much on their guard against the approach of man, where they have

been much molested; but where they have been subjected to no molestation, they are far from being shy, and approach very close to boats, or to men on shore, as if animated by curiosity. They are much affected by musical sounds. A flute is said to attract seals to a boat, where they have not learned caution from sore experience; and the ringing of the church bell at Hoy, in Orkney, has very often caused the appearance of numerous seals in the little bay. Seals possess all the five senses in perfection.

The common seal and some of the other species are very intelligent; but there is considerable difference in this respect among the species. The common seal and some others have often been tamed, and are capable of living long in domestication, if freely supplied with water. They become very familiar with those who attend to them, and are very fond of caresses and of notice, recognize their name like dogs, and readily learn many little tricks, of which advantage has been taken for exhibitions.

Seals are found in all the colder parts of the world, most abundantly in the arctic and antarctic regions; some of them also in temperate climates, as far s. as the Mediterranean, and as far n. as the La Plata. Some of them ascend rivers to some distance in pursuit of salmon and other fish. They are found in the Caspian sea, and even in the fresh water lake Baikal.

The species are numerous, but in no group of mammalia does more remain for further investigation. Seals are divided into two principal groups—*seals*, more strictly so called, and *otaries* (q.v.); the former distinguished by the complete want of external ears, which the latter possess, and by their dentition. The true seals have been further subdivided into genera, chiefly characterized by their dentition. In the restricted genus *phoca* or *calocephalus*, the incisors are pointed and sharp-edged, six above and four below. The common seal (*phoca vitulina*) is found in the northern parts of the Atlantic ocean, and in the Arctic ocean. It is common on the wilder and more unfrequented parts of the British coast, particularly in the north. It is remarkably distinguished, even among its nearest congeners, by the oblique position of the molar teeth. The fur is yellowish, variously spotted, and marked with brown. The whole length is from 3 to 5 feet. Its love of salmon is so great that it has been known to haunt the neighborhood of a salmon-net for a long time, and to take the fish after they were entrapped in it. The common seal is generally seen in small herds. Its skin and oil are of considerable mercantile importance. The skin is dressed with the fur on, to make caps, etc., or is tanned and used as leather. The oil, when made before decay has begun, is colorless and nearly inodorous; it is much superior to whale-oil. The flesh is much used for food in very northern countries, as is that of all the other species which they produce. It is not easy to shoot a seal. While flint-locks were in use, the seal always dived so quickly on seeing the flash as generally to escape the ball. The popular name SEACALF, and the specific name *vitulina*, have reference to a supposed resemblance of the voice to that of a calf. The HARP SEAL (*P. Greenlandica*) receives its popular name from a large, black, crescent-shaped mark on each side of the back. It is sometimes seen on the British coasts, but belongs chiefly to more northern regions. It is from 6 to 8 or even 9 ft. in length.—The GREAT SEAL, or BEARDED SEAL (*P. barbata*), also found on the British coasts, and plentiful on the coasts of Greenland, is generally about 9 or 10 ft. long, sometimes more.—The ROUGH or BRISTLED SEAL (*P. hispida*) frequents quiet bays on the coasts of Greenland, where many thousands are annually killed for their skins and oil. It is the smallest of the northern species.—The GRAY SEAL (*Halichærus griseus*), which has a very flat head, and attains a size nearly equal to the Great seal, occurs on the British coasts, but is much more common in more northern latitudes, and in the Baltic sea.—The CRESTED SEAL (*Stenmatopus cristatus*) is remarkable for the elevation of the septum of the nose of the adult male into a crest, which supports a hood covering the head, and capable of being distended and elevated or depressed at pleasure. The use of this appendage is not known. This seal is plentiful on the coasts of Greenland and the northern parts of North America.—The seals of the southern seas are quite distinct from those of the northern. One of them is the SEA LEOPARD, or LEOPARD SEAL (*Leptonyx Weddellii*), so called from its spotted fur. It is found on the South Orkneys and other very southern islands. By far the largest of all the seals is the ELEPHANT SEAL, or sea elephant of the southern seas.

Seals are to some extent migratory, although their migrations do not extend to very great distances, and are probably regulated by the abundance or scarcity of food. The time of the return of certain species to certain coasts, is very confidently reckoned upon by the natives of the n. and by seal-hunters.

Seal-hunting—or *fishing*, as it is often called—requires great patience and skill. Most of the seals, if not all, are gregarious, and one seems to be always placed on the watch, where danger is to be apprehended from bears or from hunters. They climb up through holes in the ice-fields of the polar seas, even when there is a height of several feet from the water, but it is difficult for the hunter to get between them and the hole. Nor is seal-hunting unattended with danger, an enraged seal being a formidable antagonist, at least to the inexperienced.

Seal-hunting is the great occupation of the Greenlanders, but it is also extensively prosecuted in other northern parts of the world; great numbers are taken on the coasts of Newfoundland and other northern parts of America; whale-fishers kill seals as they

find opportunity. The fur seals of Alaska are obtained from the islands of St. George and St. Paul, in the Pribylov group. Of late years the destruction of seal life has been so great as to threaten the extinction of the animals, especially in the fisheries of Alaska. For this reason, in June, 1891, after representations to this effect had been made by Mr. Blaine, the secretary of state, an arrangement was entered into by the American and English governments, temporarily prohibiting the destruction of seals, with the exception of 7500, which were allowed to be killed as food for the natives. This constituted what is technically known as a "close season." See OTARY.

SEAL OF CONFESSION. See CONFESSION and CONFIDENTIALITY.

SEALING-WAX. A composition of hard resinous materials used for receiving and retaining the impressions of seals. Simple as it may appear, its manufacture is one of great importance, and formerly was far more so than at present—the use of gummed envelopes having to a great extent superseded it. Common beeswax was first used in this country and in Europe generally, being mixed with earthy materials to give it consistency. Nevertheless, it was difficult to preserve it, as a very small amount of heat softened it.

The Venetians, however, brought the Indian sealing-wax to Europe, and the Spaniards received it from the Venetians, and made it a very important branch of their commerce. The great value of the Indian wax consisted in the fact that it was made only of shell-lac, colored with vermilion or some other pigment, and this has been found superior to all other materials. In addition to the shell-lac and coloring material, there is always added to the wax made in Europe a portion of Venetian turpentine (see TURPENTINE), and of resin.

SEA-LION. See OTARY.

SEA-LION, in heraldry, a monster consisting of the upper part of a lion combined with the tail of a fish.

SEAL ISLANDS, or **LOBOS ISLANDS.** See PERU.

SEALKOTE, a t. in the Punjab, near the left bank of the Chenab, 65 m. n. from Amritsar. It contained '91, 55,087 inhabitants, and carries on the manufacture of cotton and paper. Sealkote was formerly a military station, and at the period of the outbreak of the Indian mutiny, there was a rifle-practice dépôt here.

SEALSFIELD, CHARLES, 1793-1864; b. Moravia; the assumed name of Karl Postl. In early life he was secretary to a religious order at Prague, and afterward traveled extensively in the United States, Mexico, and Central America. He then settled at Solothurn, Switzerland, where he devoted himself to literature, writing among other books, *Transatlantic Traveling Sketches*; *Pictures of Life in both Hemispheres*; *North and South*; *The Viceroy and the Aristocracy*. See his life by Faust (1896).

SEAMEN are technically those persons below the rank of officer, who are employed in navigating decked vessels on the high seas—men working on lakes and rivers being styled "watermen." Two opposite conditions are essential to the well-being of the vessel—first, the absolute subordination and perfect obedience of the crew to the master; and secondly, their protection against tyranny or caprice on his part. For this purpose the law of England is extremely minute in the rules laid down for both masters and seamen.

By an act of 1845, specially leveled against pimps and swindling agents, no person may hire seamen except the owner or master of a ship, and individuals licensed for that purpose by the board of trade. Under the mercantile marine act of 1850, a written agreement must be made when a man is engaged, setting forth the nature and length of voyage, the capacity in which the man is to be employed, wages, fines, provisions, punishments, etc. If the ship be going abroad, this agreement must be attested before a shipping-master, who has a power of periodical inspection over the agreements of all seamen in vessels in his port. Any clause in the agreement would be inoperative which deprives the sailor of a lien upon his ship, or of other recovery for his wages, or of rights of salvage. In virtue of this agreement the seaman is bound to do his utmost in the service of the vessel; and consequently, if a master of a ship in distress promise his men extra pay for extraordinary exertions, the men cannot compel him to fulfill his promise.

In the event of disobedience or insubordination the master may administer correction, the law holding him responsible that such correction is reasonable. Desertion from the ship is punishable by imprisonment; and deserters may be apprehended on the information of the master without warrant. In case of open mutiny, the master may adopt the most stringent measures.

The mariner's wages are not due in case of loss of the ship, unless he duly exerted himself, and only up to the date of loss. It is a misdemeanor for the master to leave a sailor on shore in foreign parts, unless through the man's wrongful act.

Seamen who are as a class supposed to be especially subject to imposition while on shore and subject to cruel treatment while at sea, are protected by statutes regulating the method of their employment, their rights as to pay, their treatment while at sea, and their return to this country after discharge. Sailors in the U. S. navy are of course governed by the rules of the service; mercantile seamen from their contract by signing a

written agreement called the shipping articles, which every master of a vessel is required to have. This must describe clearly, the voyage with the ports at either end, the rate of wages and all other matters necessary to a full understanding of the contract. Such articles are not beyond impeachment by parol evidence. Penalties for the violation of the contract on either side are provided. The master is bound to furnish a seaworthy vessel, a survey being allowed on application of one mate and a majority of the crew. Not only is he bound to furnish provisions but the amount is fixed by statute; and if they fall short he forfeits a day's pay to each man while on short allowance. The master is bound to pay the wages, but may deduct 40 cents a month for the marine hospital fund or declare all or part forfeited as punishment for insubordination. Other punishments are extra work, imprisonment, confinement in irons, etc.; flogging was abolished by the act of 1850, but it is held that this does not include blows struck in the heat of anger. If the seaman desert before the voyage, he may be seized on a warrant and confined until the ship sails, forfeiting double his advance wages. If he desert on the voyage he forfeits his entire wages and all property on board. But if compelled to desert by cruelty, this does not hold. Sailors have a wages lien on both ship and freight. Engineers, pilots, clerks, and stewards, are sailors as to their rights of wages, etc. The master must present his papers to the U.S. consul in all ports visited and must explain absences. If he discharge a man abroad he is bound to pay three months' wages beyond what is due. Of this one-third goes to a fund for the maintenance of our seamen in foreign countries and for bringing them home. If a sailor be discharged without cause and against his will in a foreign port, the master is liable to six months' imprisonment or a \$500 fine. See SHIPPING, LAW OF.

SEA-MOUSE, *Aphrodite*, a genus of dorsibranchiate annelida, of the family *aphroditidae*, to all of which the popular name is extended. They are readily distinguished by two longitudinal ranges of broad membranous scales covering the back, under which are the gills in the form of little fleshy crests. The scales move up and down as the animal respire; and are concealed by a substance resembling tow or felt, which permits the access of water but excludes mud and sand. The head is furnished with tentacles; some have two eyes and some four. The body is edged with spines. Besides all this, its sides are covered with flexible bristles or silky hairs, which give to these creatures a wonderful beauty of color, unsurpassed by that of humming birds or the most brilliant gems. Each hair, even when viewed singly, and moved about in the sunshine, reflects all the hues of the rainbow. Yet sea-mice are generally to be found concealed under stones, and dwell among the mud at the bottom of the sea. Storms frequently throw them on the beach in great numbers.

SÉANCE (Fr., "a sitting"), is the name given in France to the session of any deliberative body. In America the term is applied especially to conferences held by Spiritualists. See SPIRITUALISM.

SEA-NETTLE. See *ACALEPHÆ*.

SEA-PARROT. See *AUK*.

SEA-PIE. See *OYSTER-CATCHER*.

SEA-PIKE, *Centropomus undecimalis*, a fish, which, notwithstanding its popular name, belongs to the perch family. Its form, however, is elongated like that of the pike. The body is compressed; there are two dorsal fins; the mouth is not very large; and the teeth are numerous, small, and equal. The color is silvery-white, tinged with green on the back. It is found on the western coasts of tropical America. It attains a large size, and is a valuable fish. On the British coasts, the name sea-pike is sometimes given to the garfish.

SEA-PINK. See *THRIFT*.

SEA-PORCUPINE. See *DIODON*.

SEA-RAVEN. See *BULLHEAD*.

SEARCH, RIGHT OF. See *INTERNATIONAL LAW*.

SEARCH OF INCUMBRANCES means the inquiry made by a purchaser or mortgagee of lands as to the burdens and state of the title, in order to see whether his purchase or investment is safe. Owing to the want of any general system of registration of deeds affecting land in England, it is not possible by any search to find out with certainty all these burdens; nevertheless, there are some special registers which are usually included in such searches, such as judgment debts, bankruptcies, disentailing deeds, annuity deeds, etc. The search usually goes back for 60 years. In Scotland, where all the deeds affecting land rights are registered, it is easy to discover the exact state of the title and burdens on the land. The usual search is made only for 40 years. The registers are subdivided into various kinds—as the general and particular register of Sasines, the record of Abbreviations of Adjudications, register of Inhibitions, etc. See *RECORDS*.

SEARCH-WARRANT is an authority granted to a constable by a justice of the peace to enter the premises of a person suspected of secreting stolen goods, in order to discover, and if found, to seize the goods; and similar warrants are granted to discover property in respect of which other offenses are committed. Before such a warrant can be issued, a credible witness must on oath prove a reasonable cause to suspect that the party pro-

ceeded against has the property in his possession or in his premises. The name of the person whose premises are to be searched must be correctly described in the warrant.

The fourth amendment to the United States constitution expressly prohibits the "general warrants," which were at one time granted in England in behalf of the government, particularly in cases of alleged sedition or libel, upon suspicion solely, without specifications. The amendment in question provides that the right of the people to be secure in their persons, houses, papers, and effects, against unreasonable searches and seizures shall not be violated, and no warrants shall issue but upon probable cause, supported by oath or affirmation, and particularly describing the place to be searched, and the persons or things to be seized. Similar provisions are found in most of the state constitutions.

SEARCY, a co. in n. Arkansas; drained by a branch of Red river, and the Buffalo fork of White river; 768 sq.m.; population, 1890, 9664, inclu. colored. The surface is hilly, and heavily timbered. The soil is moderately fertile. The principal productions are corn and cotton. Co. seat, Marshall.

SERIES SYSTEM. See **ELECTRIC LIGHTING**.

SEARING, LAURA CATHERINE WALLER (REDDEN), "Howard Glyndon," b. Maryland, 1840; came by direct descent on the mother's side, from sir William Waller, of Osterly Park, Middlesex, England. Her family removed to St. Louis, her father being murdered in 1848. In 1851 she became totally deaf from illness, and soon after lost her speech. She began writing for publication in 1855, and became assistant editor of the St. Louis *Presbyterian* a few years later. In 1860-62 she was Washington correspondent of the Missouri *Republican*, and published *Notable Men of the 37th Congress*, and *Idyls of Battle* a collection of war poems. In 1865 she visited Europe, corresponding with the Missouri *Republican* and New York *Times*. She continued to contribute to the press after her return in 1867, and in 1874, published *Sounds from Secret Chambers*, a volume of poems. In 1871 she entered the articulation school at Northampton, Mass.; where, and at a similar school in Mystic, Conn., and for a time with Prof. A. Graham Bell, she studied the new system for teaching the dumb to talk; and with such success that she regained intelligible speech in 1873-74. In 1876 she was married to Edward W. Searing, a lawyer of New York, who removed to California in 1886. She is a versatile writer, spirited and graphic in prose, and graceful and earnest in verse.

SEARLE, JAMES, 1730-97, b. New York; a merchant in Madeira, who settled in Philadelphia in 1763. He was a signer of the non-importation agreement of 1765; a member of the navy board in 1778; a delegate to congress 1778-80, and then chairman of the commercial committee. He was in Europe, 1780-82, endeavoring, but unsuccessfully, to negotiate a state loan for Pennsylvania.

SEA-ROBIN. See **GURNARD**.

SEARS, BARNAS, D.D., LL.D., 1802-1880; b. Sandisfield, Mass., graduate of Brown university, 1825; studied theology at Newton, was settled over the First Baptist church in Hartford, Conn. In 1829 he was prof. in Madison university, New York, formerly the Hamilton literary and theological seminary. He went to Germany in 1833, studied at Halle, Leipsic, and Berlin. On his return he was appointed prof. of theology at Newton seminary, subsequently president—residing there 12 years. He was at one time secretary and agent of the Massachusetts board of education; succeeding Horace Mann. In 1855-67, he was pres. of Brown university, resigning to become general agent of the Peabody education fund for advancing education in the southern states. He edited the *Christian Review* and contributed to the *Bibliotheca Sacra*, and published among other works, *Ciceroniana, or the Prussian mode of Instruction in Latin* (1844); *Select Treatises of Martin Luther in the Original German* (1846); a revised edition of *Roget's Thesaurus* (1854); *A Discourse on the Completion of the First Century of Brown University* (1864). He had high scholarship, and an admirable organizing capacity.

SEARS, EDMUND HAMILTON, D.D., 1810-76; b. Mass.; graduated at Union college in 1834, and Harvard divinity school in 1837; pastor of the First Unitarian church, Wayland, Mass., 1839-40; at Lancaster, 1840-47; at Weston, Mass., in 1865. He published *Regeneration Pictures of the Olden Time: Athanasia: Fore-gleams of Immortality; the Fourth Gospel; the Heart of Christ; Christian Lyrics; Sermons and Songs of the Christian Life*. He edited for several years with the Rev. Rufus Ellis the *Monthly Religious Magazine*, Boston. He was a man of eminently devout and spiritual mind, an evangelical believer, a graceful and vigorous writer.

SEARS, ISAAC, 1729-86; b. Conn.; commanded a privateer and cruised against the French, 1758-61, but lost his vessel by shipwreck. He then engaged in the European and West India trade. After the passage of the stamp-act he was the foremost of the sons of liberty in New York, and was active during the war; was a member of the N. Y. provincial congress and of the assembly in 1783.

SEA-SERPENT, the name given to gigantic animals, presumed of serpentine form, which are believed by many naturalists to exist in the sea-depths, especially in tropical oceans. The question of the existence of a sea-serpent has long formed one of the knotty

problems of zoological science. But it seems reasonable to conclude that there exists a certain basis for the supposition that undescribed marine forms do exist in the sea-depths, and that the most reliable tales of sea-serpents take origin from appearances of such animals. Of such tales, possessing a warrantable basis of fact, and emanating from authoritative sources, that of Capt. M'Quhae is one of the best known. This account was published in 1848. Capt. M'Quhae commanded H.M.S. *Dædalus*, and encountered the serpentine form in lat. 24° 44' s., and long. 9° 20' e., and therefore in the s. Atlantic ocean, near the tropic of Capricorn, and not very far from the coast of Africa. It was not, as in other cases, in bright and fine weather, but in dark and cloudy weather, and with a long ocean swell. The animal was swimming rapidly, and with its head and neck above water. Capt. M'Quhae, in his report to the admiralty, describes it with confidence as "an enormous serpent, with head and shoulders kept about 4 ft. constantly above the surface of the sea;" and he adds: "As nearly as we could approximate by comparing it with the length of what our maintopsail-yard would show in the water, there was at the very least 60 ft. of the animal *à fleur d'eau*, no portion of which was, to our perception, used in propelling it through the water, either by vertical or horizontal undulation. It passed rapidly, but so close under our lee-quarter, that had it been a man of my acquaintance, I should have easily recognized his features with the naked eye; and it did not, either in approaching the ship or after it had passed our wake, deviate in the slightest degree from its course to the s.w., which it held on at the pace of from 12 to 15 m. per hour, apparently on some determined purpose. The diameter of the serpent was about 15 or 16 in. behind the head, which was, without any doubt, that of a snake; and it was never, during the 20 minutes that it continued in sight of our glasses, once below the surface of the water; its color a dark-brown, with yellowish-white about the throat. It had no fins, but something like the mane of a horse, or rather a bunch of sea-weed, washed about its back." Regret has been very naturally expressed that Capt. M'Quhae did not bestow a shot on it. Figures prepared from a sketch by him were published in the *Illustrated London News*, Oct. 28, 1848. About the same time the testimony of another witness, Lieut. Drummond, appeared, and was found to differ in some important points from the account of the animal given by Capt. M'Quhae, and the figures published with his approbation, particularly in ascribing a more elongated form to the head, in the mention of a back fin, whereas Capt. M'Quhae expressly says that no fins were seen; and in a lower estimate of the length of the portion of the animal visible. Lieut. Drummond's words are: "The appearance of his head, which, with the back fin, was the only portion of the animal visible, was long, pointed, and flattened at the top, perhaps 10 ft. in length; the upper jaw projecting considerably; the fin was, perhaps, 20 ft. in the rear of the head, and visible occasionally; the capt. also asserted that he saw the tail, or another fin about the same distance behind it; the upper part of the head and shoulders appeared of a dark-brown color, and beneath the under jaw a brownish-white. It pursued a steady and undeviating course, keeping its head horizontal with the water, and in rather a raised position, disappearing occasionally beneath a wave for a very brief interval, and not apparently for the purposes of respiration. It was going at the rate of perhaps from 12 to 14 m. an hour, and when nearest was perhaps 100 yards distant. In fact, it gave one quite the idea of a large snake or eel." Lieut. Drummond's account is the more worthy of regard, as it is derived from his log-book, and so gives the exact impressions of the hour, while Capt. M'Quhae's was written from memory after his arrival in England. Into the discussion which arose concerning this case, it is out of our power to enter.

In 1875 a battle between a sea-serpent and a whale was viewed from the deck of the good ship *Pauline* of London, Capt. Drevar, when proceeding with a cargo of coals from Shields to Zanzibar, destined for her majesty's ship *London*. When the *Pauline* reached the region of the trade-winds and equatorial currents, she was carried out of her course, and after a severe storm, found herself off cape Roque, where several sperm-whales were seen playing about her. While the crew were watching them, they suddenly beheld a sight that filled every man on board with terror. Starting straight from the bosom of the deep, a gigantic serpent rose and wound itself twice in two mighty coils round the largest of the whales, which it proceeded to crush in genuine boa-constrictor fashion. In vain did the hapless whale struggle, lash the water into foam, and even bellow, for all its efforts were as nothing against the supernatural powers of its dreadful adversary; whose strength may be further imagined, from the fact that the ribs of the ill-fated fish were distinctly heard cracking one after the other with a report like that of a small cannon.

Of no less a ship than her majesty's yacht the *Osborne*, the capt. and officers, in June, 1877, forwarded an official report to the admiralty containing an account of a sea-serpent's appearance off the coast of Sicily on the 2d of that month. "The time was five o'clock in the afternoon. The sea was exceptionally smooth, and the officers were provided with good telescopes. The monster had a smooth skin, devoid of scales, a bullet-shaped head, and a face like an alligator. It was of immense length, and along the back was a ridge of fins about fifteen ft. in length and six ft. apart. It moved slowly, and was seen by all the ship's officers."

This account was further supplemented by a sketch, from the pencil of Lieut. W. P. Hynes of the *Osborne*, who to the above description adds, that the fins were of irregular

height, and about 40 ft. in extent, and "as we were passing through the water at ten and a half knots, I could only get a view of it 'end on.'" It was about 15 or 20 ft. broad at the shoulders, with flappers or fins that seemed to have a semi-revolving motion. "From the top of the head to the part of the back where it became immersed, I should consider about 50 ft., and that seemed about a third of the whole length. All this part was smooth, resembling a seal."

These instances are but examples of the many cases, in which narratives of the most circumstantial character have been recorded, regarding the appearance of serpentine animals, usually in tropical seas.

As will readily be admitted, the chief point at issue is that of the zoological determination of the forms reported to have been seen. Gigantic cuttle-fishes, now proved to have a veritable existence, might in many cases imitate an elongated marine form swimming near the surface of the sea. Certain fishes, such as the basking shark (*selache maxima*) would also under certain circumstances appear as unusual marine forms, and as Dr. Andrew Wilson, of the Edinburgh medical school, has pointed out, the well-known tape fishes (*gymnetrus Banksii*) would very accurately reproduce the features of a marine snake, especially when these fishes, as is well known, are developed to an immense size. The marine snakes or *hydrophiæ* of the Indian ocean would also serve to personate the "great unknown," if largely developed; and indeed, as Dr. Wilson has pointed out, in the idea of the immense development of ordinary marine animals may be found a probable clue to the sea-serpent mystery. Cases of mere serpentine appearances assumed by certain animals are not to be confused with cases in which a single animal has presented a serpentine aspect. Flocks of shags swimming close to the water's edge might personate a sea-serpent swimming along the top of the water (see *Nature*, Sept., 1878); but a flock of birds would have been readily detected by Capt. McQuhae, and by many other observers who have beheld the unknown form from a near distance. The reader who wishes for a full discussion of the scientific aspects of this question may consult a paper entitled "The Sea-Serpents of Science," in Dr. Andrew Wilson's volume, *Leisure Time Studies* (Chatto & Windus, London, 1878).

SEA-SHORE, or land bordering on the sea, belongs partly to the crown, and the public have certain rights in relation thereto. The soil or property in the sea-shore is vested in the crown, and the limit on the land side is defined to be the medium line of high-water of all the tides in the course of the year, or the height of the medium tides in each quarter of a lunar revolution during the whole year. But though the crown is *prima facie* the owner of the sea-shore, the owner of the adjoining manor has sometimes a grant of it, and he proves this grant by ancient use—such as gathering sea-weed, etc. The public have a right to walk on that part of the shore vested in the crown, which holds it as a trustee for them. But the public have no right to trespass on the adjacent lands in order to get at the shore, so that it is only where a highway leads to the shore, or the public land from seaward, that the right can be made available. Thus it has been decided that the public have no legal right to trespass on the adjoining lands in order to get to the shore for purpose of bathing. The public have a right to fish on the sea-shore if they get legal access to it, and may take all floating fish, but not oysters or mussels which adhere to the rock, if the soil belongs to an individual. The public have no right to gather sea-weed or shells, though, as regards the latter, it is of so little consequence that nobody prevents them. Nor have fishermen a right to go on that part of the sea-shore which is private property to dig sand for ballast, or to dry their nets, or similar purposes, though in a few cases local customs permitting this have been held valid. In Scotland the right to the sea-shore is also vested in the crown, but when a crown grant gives land bounded by the sea-shore, this is held to give to the grantee the fore-shore also.

SEA-SICKNESS is a variety of vomiting deserving of special notice. It is often preceded by premonitory symptoms, which appear almost immediately after a susceptible person is exposed to the motion of rolling water in a vessel or boat, and are as distressing as the vomiting itself. Amongst these symptoms may be mentioned vertigo and headache, with a peculiar feeling of sinking and distress about the pit of the stomach. Vomiting, however, in general, soon comes on, accompanied with convulsive heaving of the stomach, and such an indescribable feeling of prostration as to render the patient utterly regardless of what is going on around him, and almost indifferent to life. Moreover, a deadly pallor, a profuse cold sweat, and diarrhea, are more or less commonly present. The susceptibility to this troublesome affection varies extremely in different persons. Some never suffer from it, others only on their first voyage, and others, again, in every voyage they undertake; with some it continues but a few hours, while others suffer almost continuously throughout a long voyage. In the great majority of cases the sickness disappears in a few days, unless the weather be very boisterous. It almost always ceases on landing, although more or less giddiness may prevail for some hours, the patient when walking feeling as if the earth were rising up under his feet. Infants and aged persons are supposed to possess a comparative immunity from sea-sickness, while, as a general rule, women suffer more than men. According to Dr. Althaus, persons with a strong heart and a slow pulse generally suffer little from sea-sickness; while irritable people, with a quick pulse and a tendency to palpitation, are

more liable to be affected; and he thus accounts for different liability of different nations to this affection; "for, as a rule, the French and Italians, being of a more irritable temper, suffer most from the disorder, the Germans less, and the English least.

The primary cause (or rather condition) of sea-sickness is the motion of the ship; and the pitching of a vessel, or alternate rising and falling of the bow and stern, is especially apt to produce it. It is less felt in large and heavily ballasted vessels, because the movements referred to are least perceptible in them. How this cause operates is a subject regarding which there has been much discussion; and, without entering into the history of the views of different physicians on this subject, we may state that the most recent is that of Dr. Chapman, who holds that the motions of the vessel cause the accumulation of an undue amount of "blood in the nervous centers along the back, and especially in those segments of the spinal cord related to the stomach, and the muscles concerned in vomiting." This condition is induced, as he maintains, in three different ways, viz., (1.) by the movements of the brain, which are much greater in a pitching vessel than on land; (2.) by the corresponding movements of the spinal cord; and (3.) by the excessive movements of the viscera within the abdominal and pelvic cavities. In one person the brain may be mainly responsible in causing that preternatural afflux of blood in the spinal cord, on which (according to Dr. Chapman's hypothesis) sea-sickness depends; in another, the spinal cord may be the main agent; and in a third, the abdominal viscera; although each is always concurrent in some degree. Hence, the only scientific and really effective remedy for this disorder must be one which has the power of lessening the amount of blood in the whole of the nervous centers along the back, and this can be done by lowering the temperature of the spinal region by the local application of ice. For a description of Dr. Chapman's "spinal ice-bags" (which may be obtained from any respectable surgical instrument-maker), and for the method of applying them, we must refer to his work *On Sea-sickness; its Nature and Treatment*, p. 37 (Lond. 1864). He gives the details of 17 cases in which the ice-bags were of greater or less benefit; in most of the cases the result was perfectly successful. Besides Dr. Chapman's evidence we have that of Capt. White, commander of one of the Newhaven and Dieppe boats, who states that "in ordinary weather it [Dr. Chapman's remedy] is a success. I had some difficulty in persuading passengers to try it, but those who did were benefited." Mr. Bradley, surgeon in the Cunard service, in a letter to *The Lancet*, Dec. 3, 1864, writes as follows: "I have tried this remedy in severe cases when other remedies have failed (chloroform, iced champagne, effervescing draughts, fresh air, etc.), and have very generally found it do great good. In no case does it do harm, but in the great majority of instances it soothes the nervous irritability which so commonly accompanies severe sea-sickness, induces sleep, and consequently relieves exhaustion." We are permitted to publish the following extract of a letter from Dr. Hayle of Rochdale, to Dr. Chapman, dated June 3, 1865: "I recommended a patient about to cross the Atlantic, to try one of your ice-bags for sea-sickness. The result was most satisfactory. He was never sick when wearing the bag. Once he went without it, and then, and then only, was he sick. His friend, who had no ice-bag, was frequently sick." As an ancillary remedy, the drinking of iced water, or the swallowing of small lumps of ice, may be recommended. Dr. Chapman prefers the ice, which, "brought in contact with the peripheral ends of the nerves of the stomach, will act on the same principle as it does when applied to the spinal region." A favorite remedy of late years is bromide of potassium or bromide of sodium taken in successive doses of from 15 to 25 grains.

Those who are susceptible to this distressing affection, and have not the opportunity of trying the ice-bags, may, at all events, diminish the severity of the vomiting by assuming, and as long as possible retaining, the horizontal position, as nearly as possible in the center of the ship's movement, and keeping the eyes closed. The compression of the abdomen, by means of a broad tight belt, sometimes gives relief. A few drops of chloroform on a lump of white sugar will sometimes check the tendency to vomiting in persons who only suffer slightly. A little arrowroot, flavored with brandy or sherry, is usually a kind of food that will most easily remain on the stomach, when the severity of the symptoms is abating. Dr. Wood, one of the most eminent of the American physicians of the present day, asserts that he has "found nothing under such circumstances so acceptable to the stomach as raw salt oysters."

SEA-SIDE GRAPE, *Coccoloba uvifera*, a small tree of the natural order *polygonææ*, a native of the West Indies. It grows on the sea-coasts; has orbicular, cordate, leathery, shining, entire leaves, and a pleasant, subacid, eatable fruit, somewhat resembling a currant, formed of the pulpy calyx investing a bony nut. The extract of the wood is extremely astringent, and is sometimes called **JAMAICA KINO**. The wood itself is heavy, hard, durable, and beautifully veined.

SEA-SLUG. See **HOLOTHURIA**.

SEA-SNIPE. See **TRUMPET FISH**.

SEASONING, a term in cookery for the materials used to add flavor to food. They are chiefly salt, the spices, and pot-herbs. Salt is the most important, for it not only increases the sapidity of most kinds of food, but also adds to their wholesomeness.

SEASONS. In the article **EARTH** the motions of the earth on which the changes of the seasons ultimately depend are explained. The chief cause of the greater heat of summer and cold of winter is that the rays of the sun fall more obliquely on the earth in the latter season than in the former. See **CLIMATE**. Another concurrent cause is the greater length of the day in summer, and of the night in winter. Within the tropics the sun's rays have at no time so much obliquity as to make one part of the year very sensibly colder than another. There are, therefore, either no marked seasons, or they have other causes altogether, and are distinguished as the *wet* and *dry* seasons. This is explained in the article **RAIN**. But in all the temperate parts of the globe the year is naturally divided into four seasons—*spring, summer, autumn, and winter*. In the arctic and antarctic regions, spring and autumn are very brief, and the natural division of the year is simply into summer and winter, the winter being long and the summer short; and this is very much the case also in regions of the temperate zones lying near the arctic and antarctic circles. In subtropical regions the distinction of four seasons is in like manner very imperfectly marked. This distinction is everywhere arbitrary as to the periods of the year included in each season, which really vary according to latitude, and partly according to the other causes which influence climate; the seasons passing one into another more or less gradually, and their commencement and close not being determined by precise astronomical or other phenomena. The greatest heat of summer is never reached till a considerable time after the summer solstice, when the sun's rays are most nearly vertical, and the day is longest; the greatest cold of winter is in like manner after the winter solstice, when the day is shortest, and the sun's rays are most oblique; the reason in the former case being that as summer advances the earth itself becomes more heated by the continued action of the sun's rays; in the latter, that it retains a portion of the heat which it has imbibed during summer, just as the warmest part of the day is somewhat after midday, and the coldest part of the night is toward morning. The four seasons of temperate regions are distinguished by the phenomena of nature which characterize them, and which are of the greatest importance in relation to the wants and labors of man. But the renewal of vegetative activity in spring is not to be ascribed entirely to the increasing warmth of the sun's rays. Plants are so constituted that a period of rest is followed by new activity, and this new activity very generally begins in the fresh circulation of sap and enlargement of buds while the cold of winter still continues unabated, or before it has reached its greatest intensity.

SEA-SPIDER, or **SPIDER CRAB**. See **CRAB**.

SEA-SQUIRT. See **ASCIDIA**.

SEA-SWALLOW. See **TERN**.

SEATTLE, city and co. seat of King co., Wash.; on Elliot bay, Puget sound, and the Columbia and Puget Sound, the Great Northern, the Northern Pacific, and the Seattle and International railroads; 28 m. n. of Tacoma. It has regular steamboat communication with all points on Puget sound, and in 1897 was the principal northern starting point in the United States for the great Klondike mining region. The city is the seat of the state university, the university of Seattle (Bapt.), and the academy of the Holy Names (R. C.), and has federal courts, custom-house, land-office, weather bureau, and quarters of the inspectors of steam vessels for Washington and Alaska. There are the Providence hospital (R. C.), Seattle general hospital, house of the Good Shepherd (R. C.), public library, several public parks, about 40 churches, public school property valued at over \$700,000, electric and cable street railroads, electric lights, waterworks supplied from lake Washington by pumping, several national and savings banks, and many daily, weekly, and monthly periodicals. The U. S. census in 1890 reported for Seattle, 331 manufacturing establishments, employing \$4,758,283 capital, and having a combined output, principally in lumber products, valued at \$10,203,000. The city handles large quantities of coal and lumber, and has extensive fishery interests. Pop. '90, 42,837.

SEA-UNICORN. See **NARWHAL**.

SEA-URCHIN. See **ECHINIDÆ**.

SEA-WEED AND **SEA-WRACK**. See **FUCACEÆ** and **WRACK**.

SEA-WOLF. See **WOLF-FISH**.

SEABASTE. See **SAMARIA**.

SEBASTIAN, a co. in w. Arkansas, bounded on the n. by the Arkansas river; about 600 sq. m.; population, 1890, 33,200. The surface is hilly and heavily wooded. The soil on the prairies is fertile. Co. seat, Greenwood.

SEBASTIAN, SAINT, a very celebrated martyr of the early church, whose memory is venerated in both branches of the church, east as well as west (although the scene of his martyrdom was the city of Rome), and whose story has formed one of the most popular themes of Christian artists from the earliest times. His history is contained in the so-called acts of his martyrdom, which, although partaking of the legendary tone, are regarded as authentic, not only by Baronius and the Bollandists, but also by Tillemont and others of the more stringently critical schools of ecclesiastical history. Sebastian, according to this narrative, was born at Narbonne and educated at Milan. Although a Christian, he entered the Roman army, without, however, revealing his religion, and with the view of being enabled, by his position, to assist and protect the Christians in

the persecution. In this way he supported and comforted many of the martyrs in Rome; and he even converted Nicostratus, the keeper of the prison in which the martyrs were confined, and his wife, Zoe, to whom he miraculously restored the use of her speech, after she had been dumb for six years. Still unrecognized as a Christian, Sebastian rose to high favor under Diocletian, while at the same time the grateful pontiff, Caius, named him "Defender of the Church." At length came the time for his open profession of his faith. Diocletian used every effort to induce him to renounce the Christian creed, but in vain; and in the end he was condemned to be put to death by a troop of Mauritanian archers, who transfixed him with numberless arrows, and left him as dead. But a Christian lady, Irene, finding that life was not extinct, had the body removed to her house, where life was restored; and although the Christian community desired to conceal his recovery, Sebastian again appeared in public before the emperor, to profess his faith in Christianity. Diocletian condemned him to be beaten to death with clubs in the amphitheater; and his body was flung into one of the sewers of the city, in which it was discovered, according to the *Acts of Martyrdom*, by means of an apparition, and carried by a Christian lady, Lucina, to the catacomb, which is still called by his name. The date of his martyrdom was January 20, 288. By the Greeks the feast is held on the 18th of December. The festival was celebrated with great solemnity in Milan as early as the time of St. Ambrose; and it was observed in the African church in the 4th century. There is another saint of the same name, who is said to have suffered martyrdom in Armenia.

SEBASTIAN, DOM, 1554-78; b. Lisbon; came to the throne of Portugal in 1557. In 1574 he led a successful expedition against Tangier. In 1578, with a fleet and a force of some 20,000 men, he sailed to Morocco to support Muley-Mohammed against his uncle Muley-Malek, in the contest for the throne of Morocco. Sebastian and Muley-Mohammed were defeated by Muley-Malek, and all three died. The Portuguese refused to believe in his death, and numerous impostors appeared, pretending to be Dom Sebastian.

SEBASTIANI, HORACE FRANÇOIS DE LA PORTA, marshal of France, was b. Nov. 10, 1772, at Porta d'Ampugnano, a village near Bastia, in Corsica. He was the son of a tailor, but his extreme vanity led him to declare himself of noble descent and a distant relative of the Bonapartes. He entered the army as a sub-lieutenant of infantry, 1792. His rise, due to his bravery in the field, was no doubt somewhat aided by his splendid physique, graceful manner, and facile diction. He became *chef d'escadron* in 1797, and brigadier in 1799, and was one of Napoleon's most devoted partisans. He fought at Marengo, executed some important diplomatic service in Turkey in 1802-03, after which he became gen. of brigade (Aug. 1803), and was wounded at Austerlitz. On May 2, 1806, he was again deputed to Turkey, this time to break the alliance of the Porte with Russia and England; and before he had been seven months at Constantinople, his mission had obtained complete success, and war was declared. The English fleet forced a passage through the Dardanelles, and cast anchor before Constantinople, their presence causing such terror among the sultan's ministers that a total reversal of foreign policy was imminent, but Sebastiani, coming to the rescue, revived with his seducing eloquence their failing resolution, and assuming an authoritative superintendence of the preparations for defending the coast, put the batteries in a state fit for action. In five days he had the coast batteries manned with 600 guns, 100 small gunboats afloat, a line of vessels laid along shore, each with a broadside ready to be discharged on the English fleet, which at last gallantly ran the gauntlet, losing two ships and 700 men. But the death of the sultan, and the treaty of Tilsit, put an end to the French intrigues in Turkey, and Sebastiani was recalled, June 1807, and decorated with the grand cordon of the legion of honor. He subsequently commanded the fourth corps-d'armée in Spain. He distinguished himself in the Russian campaign of 1812, and at Leipsic. On the exile of Napoleon to Elba, he gave in his adherence to the Bourbon government, but joined his old master on his return. After the revolution of 1830, he held for brief periods the portfolios of naval (1830) and foreign affairs, and the embassies to Naples (April, 1833) and London (Jan., 1835); but was more distinguished for his elegance and graceful demeanor in the Parisian salons, than as a politician or administrator. He died at Paris, July 21, 1851.

SEBASTIANISTAS, the name given in Portugal and Brazil to persons who believe in the future return to earth of the king Dom Sebastian, who fell in the battle of Alcazar-quebir, 1578 A.D., while leading on his army against the Moors. This belief has continued to be entertained by many in Portugal; but the Sebastianistas are said to be now most numerous in Brazil. On the return of Dom Sebastian, they expect Brazil to enjoy the most perfect prosperity and happiness.

SEBAS'TOPOL. See SEVASTOPOL.

SEBENICO, a small port in Austria, in the crownland of Dalmatia, 31 m. n.n.w. of Spalato. It is built on a steep slope, and was formerly defended by walls and towers. Its cathedral, a fine edifice, with a bold dome, was built 1443-1556. Its excellent harbor is defended by several forts. Pop. '90, 7014; of commune, 20,360.

SEBESTEN, **SEBESTAN**, **SEPISTAN**, or **S. PLUM**, the fruit of the *cordia myxa*, a tree of the natural order *cordiaceæ*, a native of the East Indies. The tree has ovate leaves, and an egg-shaped fruit, which is succulent, mucilaginous, and emollient, with some astringency, and was formerly an article of the European materia medica, being employed for the preparation of a lenitive electuary and of a pectoral medicine. It is believed to be the *persea* of Dioscorides. It has a sweetish taste, and is eaten by the natives of the northern Circars of India, where it grows.

SECALE. See **RYE**.

SECANT. See **TRIGONOMETRY**.

SECCHI, **PIETRO ANGELO**, 1818-78; b. Italy; joined the Jesuits in 1833. He became director of the observatory of the Roman college in 1849, and was permitted to remain in that position after the expulsion of the Jesuits, 1870-73. His discoveries in the departments of solar physics and spectroscopic analysis were numerous and important. Among his works are *Catalogo delle Stelle* (1867); *Novi Ricerchi sulle Protuberanze Solari* (1869); *Fisica Solare* (1869); and *Le Soleil* (1870).

SECE'DERS AND **SECESSION KIRK.** See **UNITED PRESBYTERIAN CHURCH**.

SECESSION—**SECEDED STATES.** See **REBELLION**, **WAR OF THE**.

SE-CHUEN', a province in China, drained by the Yang-tse-Kiang river; about 166,800 sq. m.; pop. '82, 67,712,897. Capital, Chingtu.

SECKENDORF, an old and noble family of Franconia.—**VEIT LUDWIG**, 1626-92; b. near Erlangen; studied at the gymnasia of Coburg in 1638, and at Gotha, under the patronage of Ernest, duke of Gotha. In 1643-46 he studied in the university of Strasbourg, and traveled in the Netherlands. He rose through successive grades of office till he became privy-councilor and chancellor in 1664. In that year he left the duke's service to enter that of Moritz, duke of Zeit, and was appointed to similar offices, resigning on the duke's death, and retiring to his country-house near Altenburg. In 1691 he entered the service of Frederick III., elector of Brandenburg, as privy-councilor at Berlin, and chancellor of the university of Halle. He published several works in Latin and German; also theological and historical works, discourses, and hymns.—**FRIEDRICH HEINRICH**, 1673-1763; b. Königsberg; grandson of Joachim Ludwig, entered the English and Dutch service in 1695, fought against the Turks in the war of the Spanish succession under prince Eugene; maj.gen. in the army of Augustus II. of Poland, and Saxony. He was Polish ambassador to the Hague (1713), in the negotiations for the peace of Utrecht. He became count of the empire in 1719, gov. of Leipsic in 1721, ambassador to Berlin in 1726. He concluded the treaty of Wusterhausen. He incurred the displeasure of Frederick the great by the means he used to consummate the royal marriage with the princess Elizabeth. He defeated the French at Klausen, 1735; was imprisoned three years in the castle of Gratz. He commanded the troops of the elector Charles Albert of Bavaria in 1744, and restored Munich to that prince, then Charles VII. of Germany. In 1745 he was imprisoned at Magdeburg by Frederick the Great, and released after six months' confinement on paying 10,000 thalers.

SECKER, **THOMAS**, D.D., 1693-1768; b. England; studied for the dissenting ministry, but doubting concerning some of the doctrines of Christianity, he resolved to study medicine; went to London and Paris; was persuaded by Joseph Butler, an intimate friend, to enter the church of England. After some deliberation he complied; went in 1721 to Leyden, took his degree of M.D.; returned to England; became rector of Houghton-le-Spring in 1723; prebendary of Durham and rector of Ryton in 1727; chaplain to the king in 1732, rector of St. James in 1733; was made bishop of Bristol in 1735, of Oxford in 1737; dean of St. Paul's in 1750, and archbishop of Canterbury in 1758.

SECLU'SION (OF THE INSANE). This term has recently been narrowed so as to apply to the removal of the violent insane from the ordinary wards and fellowship of an asylum to an airing court, gallery, or room so situate and furnished that its solitary occupant can neither injure himself, nor injure nor disturb others. Since the abolition of physical restraint by chains and strait-jackets seclusion has become a favored and useful mode of repression and treatment. That it should be resorted to exclusively as a remedial agent, and by the medical attendant, are now received as axioms. In 1854 the commissioners in lunacy in England ascertained, by circular, the opinions of almost all those entrusted with the care of the insane in that country, as to the employment of such means of cure; when it appeared that it was generally considered beneficial, if used for short periods, and during paroxysms of epileptic and violent mania. Even when not absolutely required for the tranquillization of the individual, seclusion may become expedient in order to secure the quiet, comfort, or safety of the patients with whom he is associated. That such an instrument may be abused and adopted from the parsimony, timidity, or ignorance of those around, is obvious. One of the lunatics liberated by Pinel in 1792 had been incarcerated or *secluded* in his dark cell for forty years; and occasionally even now the duration of the isolation may be unduly prolonged even under medical sanction; but the instances of gross and cruel seclusion in garrets and cellars, and outhouses, are now chiefly to be found in private families, and where, as in the "Flushing case," no better course is known to be practicable.

SECOND (for the derivation of which see **SCRUPLE**) is the sixtieth part of a minute, whether of time or of angular magnitude. See **MINUTE**. In old treatises we find seconds distinguished as *minute secundæ*, from minutes, or *minute primæ*. The sixteenth part of a second was called a third, but instead of this and succeeding subdivisions, decimal fractions of seconds are now employed.

SECONDARY, in geology, is the designation given to that large section of the fossiliferous strata which includes the triassic, oolitic, and cretaceous rocks. It is synonymous with mesozoic. The strata grouped under this title are separated from the inferior and superior deposits more by their organic contents than their petrological structure, and this separation is more evident between them and the older rocks than between them and the newer; and yet recent discoveries have shown that the St. Cassian beds form a connecting link between the Permian and triassic epochs. They contain a series of fossils which are partly paleozoic and partly mesozoic in their facies.

The appearance of the great types of all subsequent organisms in the secondary rocks has suggested the grouping of the fossiliferous strata in respect of their fossils into only two great divisions—viz., the paleozoic, and the neozoic—this last term including the secondary and tertiary periods.

SECONDDING is a temporary retirement to which officers of royal artillery and royal engineers are subjected when they accept civil employment under the crown. After six months of such employment the officer is seconded, by which he loses military pay, but retains his rank, seniority, and promotion in his corps. After being seconded for ten years he must elect to return to military duty, or to retire altogether.

SECOND SIGHT, a superstition or belief once common in the Scottish highlands and isles, where it is known by the Gaelic appellation *taibhsearachd*, signifying a spectral or shadowy appearance. Certain persons, called seers or wizards, were supposed to possess a supernatural gift, by which they involuntarily foresaw future events, and perceived distant objects as if they were present:

As the sun,
Ere it is risen, sometimes paints its image
In the atmosphere, so often do the spirits
Of great events stride on before the events,
And in to-day already walks to-morrow.

WALLENSTEIN.

This is to depict the lofty and poetical view of the subject, as illustrated in classic fable and early history. The highland seer, however, was chiefly conversant with the scenes and occurrences of ordinary life. "A man on a journey far from home falls from a horse; another who perhaps is at work about the house, sees him bleeding on the ground, commonly with a landscape of the place where the accident befalls him. Another seer, driving home his cattle, or wandering in idleness, or musing in the sunshine, is suddenly surprised by the appearance of a bridal ceremony or funeral procession, and counts the mourners or attendants, of whom, if he knows them, he relates the names, if he knows them not he can describe the dresses. Things distant are seen at the instant when they happen" (Johnson's *Journey to the Hebrides*). With respect to things future, Johnson thought there was no rule for determining the time between the sight and the event; but Martin, whose account of the western islands was first published in 1703, furnishes data of this kind in his classification of the visions. If an object was seen early in the morning, the event would be accomplished a few hours afterward; if at noon, the same day; and if at night the accomplishment would take place weeks, months, and sometimes years afterward; according to the time of night the vision was beheld. The appearance of a shroud was an infallible prognostic of death, and the nearness or remoteness of the event was judged by the amount of the body that was covered by the ghastly sheet; if it was not seen above the middle, a delay of a twelvemonth might be hoped for, but if it ascended high toward the head, the mortal hour was close at hand. "The vision makes such a lively impression upon the seers," says Martin, "that they neither see nor think of anything else except the vision, as long as it continues; the eyelids of the seer are erected, and the eyes continue staring until the object vanish." The power of the seer was involuntary and painful—it was no source of gain. The gradation of symbolical appearances we have mentioned, strikes the imagination and gives something like a system to the supernatural phenomena. But if we turn to the cases described by the historians of the second sight, we do not find such regular order and exactness. The evidence is vague and confused, and the incidents are often of the most trivial character. The revelations, indeed, were commonly made to poor illiterate men, predisposed from the very nature of the country—wild, dreary, and remote—and from their half-idle, solitary life, to melancholy and superstition. These causes must have led very early to belief in the second sight. We find it coloring portions of the story of Wallace and Bruce, and associated with the tragic fate of the accomplished James I. of Scotland. A Scottish seer is said to have foretold the unhappy career of Charles I., and another the violent death of Villiers, duke of Buckingham. In 1652 a Scottish lawyer, sir George Mackenzie, afterward lord Tarbat, when driven to the highlands by fear of the govern-

ment of Cromwell, engaged himself in making inquiries concerning this supposed supernatural faculty, and wrote a minute account of its manifestations addressed to the celebrated Robert Boyle, which, with other relations on the same subject, is published in the correspondence of Samuel Pepys. Next came Martin's copious description; then a highland minister, the rev. John Fraser of Tyree, collected *Authentic Instances*, which were printed in 1707; and in 1763, appeared the ambitious treatise of *Theophilus Insulanus*, or Macleod of Hamir, which contained the narratives of Fraser, of Aubrey, the English antiquary, and other authorities, with the addition of a great number of cases—nearly a hundred—gathered by himself from various sources, and also numerous letters from highland ministers. This work exhausted the subject, but the wretched vanity, credulity and weakness of Theophilus covered it with ridicule. A fresh revival took place after the memorable *Journey to the Hebrides* by Dr. Johnson, whose work was published in 1775. The second sight was sure to interest a melancholy, meditative "rambler" like Johnson. He had read of it in his youth in Martin's history. He was naturally superstitious. He had a stout courageous heart and strong nerves in all mundane matters and positions, but he had a morbid fear of death, and an almost childish eagerness to pierce the darkness of futurity, and to believe in the possibility of messages from the other world. Johnson anxiously questioned the clergy and others respecting the supernatural communications made to the seers, and would gladly have believed them real. The evidence, however, was not complete or invincible; and with that love of truth, which was one of the strongest virtues of the sage of Bolt court, he confessed that he never could "advance his curiosity to conviction, but came away at last only willing to believe." On one occasion we find Johnson enunciating the true doctrine in such cases. He observed, as Boswell reports, that "we could have no certainty of the truth of supernatural appearances unless something was told us which we could not know by ordinary means, or something done which could not be done but by supernatural power; that Pharaoh, in reason and justice, required such evidence from Moses; nay, that our Saviour said: 'If I had not done among them the works which none other man did, they had not had sin.'" Undoubtedly works or facts, not merely appearances, are required for conviction. Spectral sights may be caused by dreams or disease (see APPARITIONS), by accidental optical illusions, or by the workings of a vivid imagination. It seems degrading to the idea of divine power to suppose that special miracles were wrought to announce the marriage or death of a highland peasant, the wreck of a boat, or the arrival of a stranger in a remote island of the Hebrides. Ignorance is a great ally of superstition, as solitude is of gloomy egotism and melancholy; and since education has penetrated into the highlands and isles, and intercourse with other parts of the kingdom has been facilitated by increasing trade and improved means of communication—to say nothing of the effects of that passion for highland scenery and sport which every year takes crowds of visitors to the country—the belief in second sight, as in astrology and witchcraft, has almost wholly disappeared from the land. It never had the cruel, hard, and revolting features of witchcraft—formerly prevalent in the lowlands when scarcely known in the Hebrides—and it still seems picturesque enough to serve for the purposes of poetry and romance.

SECRET (Lat. *secreta*, i.e., *oratio*, the secret prayer), one of the prayers of the mass (q.v.), of the same general form with the "collect," but recited by the priest in so low a voice as not to be heard by the people, whence the name *secreta* is derived. It follows immediately after the oblation of the eucharistic bread and wine. This use of silent prayer in the public service is one of the subjects of controversy between Catholics and Protestants.

SECRET, DISCIPLINE OF THE (Lat. *Arcani Disciplina*), a discipline of the early church, founded upon the words of Christ, "give not that which is holy to dogs," Matt. vii. 6, in virtue of which Christians fully initiated in the doctrine and practice of the church withheld from pagans and catechumens in the preparatory stage the knowledge of certain doctrines, and the liberty of presence at certain rites connected with the most solemn mysteries of the Christian religion. This practice originated in the obloquy which was drawn upon the doctrines of the church from the false and monstrous conceptions of these doctrines which were circulated among pagans. Against these calumnious misconceptions the earliest of the so-called "apologies" are addressed; and it seems certain that at the time at which Justin wrote his first apology, the middle of the 2d c., no objection existed against speaking openly of the mystery of the eucharist. —(See *Justin's Apol.*, i. 66.) Very soon after this, however, the "secret" is clearly traceable. The first reason for its adoption was that assigned above—namely, to guard the more sacred and mysterious doctrines from popular misconception and blasphemy among the pagans. This precaution of concealment was extended to catechumens, partly in order to avoid shocking too suddenly their half-formed convictions by the more startling improbabilities of Christian belief; partly also, no doubt, to guard against the danger of the betrayal of these mysterious doctrines to pagan spies approaching in the false garb of catechumens. The discipline of the secret appears in several forms—(1.) Both unbelievers and catechumens were removed from the church at the commencement of that portion of the liturgy which specially relates to the celebration of the eucharist—the so-called *Missa Fidelium*. See *Mass*. (2.) The lectures addressed by the

presiding teacher to the great body of the catechumens in general were confined to the general doctrines of Christianity. The more mysterious doctrines, those which regarded the sacraments of baptism and the eucharist, called "mystagogic," were only communicated at the close, and to those only who had undergone the preliminary probation. (3.) The eucharist, if referred to at all in the presence of the uninitiated, was spoken of in words so conceived as to conceal its nature. Many curious examples of this concealment might be cited. Origen, alluding to the eucharist (Hom. 8, in Exod. 4), says merely: "The initiated know what I mean." When Chrysostom was writing to pope Innocent I. an account of a tumult in the church at Constantinople, in which the sacred cup was upset, and the consecrated elements spilled, he says, without reserve, "The blood of Christ was spilled." But Palladius, the deacon, in his life of Chrysostom, which was designed for the pagans as well as for the Christians, takes the precaution to use the words "the symbols which are known to the faithful." Still more curiously, Epiphanius, in citing the well-known words of the eucharistic formula, "This is my body," suppresses the word under which the mysterious idea is contained, and writes, "This is my *that thing*." *Touto mou esti tode*. A very curious example of this amphibological language regarding the eucharist will be seen in a Greek inscription discovered some years since at Autun, in France.—(See *Edin. Rev.*, July, 1864.)

There is some uncertainty as to the period during which this discipline lasted in the church. It commenced most probably in the time of Justin, as his contemporary, the heretic Marcion, is known to have protested against it as an innovation (Neander's *Kirchen-geschichte*, i. 540). It is even thought not impossible by some that Justin's mode of writing was an exceptional one, and that the secret may have been in use before his time. On the other hand, it is certain that it outlived the period out of the condition of which it arose, and was maintained long after the ages of persecution. The traces of it had not entirely disappeared in the 6th century.—(See Schelstrate, *Diss. de Discip. Arcani*, 1685; Scholliner, *Diss. de Discip. Arcani*, 1756; and on the Protestant side, Tenzel, *De Discip. Arcani* (in reply to Schelstrate); Rothe, *De Disc. Arcani*, Heidelberg, 1831.)

SECRETARY, **SECRETARY FALCON**, **SECRETARY BIRD**, or **SERPENT-EATER**, *Gypogeryx*, a genus of birds of prey, which has been variously placed by naturalists among the *falconidæ* and the *vulturidæ*, and has been also constituted into a distinct family, *gypogeryxidæ*. The legs are very long, as in the *grallæ*, to which, however, there is no other resemblance. The *tibiæ* are completely feathered, but the *tarsi* and toes are destitute of feathers. The tarsi are covered in front with long, large scales. The toes are armed with sharp claws; but they are short, and the feet are not formed for grasping. The hind toe is very short. The neck is much longer, and the whole form of the bird more slender than in the *falconidæ*. The wings are long, and armed with a blunt spur at the shoulder. The tail is very long. The best-known species is an inhabitant of the arid plains of South Africa. It is about 3 ft. in length; the plumage bluish-gray. It has an occipital crest of feathers without barbs at the base, which can be raised or depressed at pleasure, and the name secretary was given to it by the colonists at the cape of Good Hope from their fancied resemblance to pens stuck behind the ear. It feeds chiefly on reptiles of all kinds, which it devours in great numbers, and is so highly valued on account of the constant war which it wages against serpents, that a fine is inflicted in the Cape Colony for shooting it. It fearlessly attacks the most venomous serpents, stunning them with blows of its wing, also seizing and carrying them into the air to such a height that they are killed by the fall. It uses its feet also to overpower its prey, striking violent blows with them. Small serpents are swallowed entire; the larger ones are torn to pieces. The secretary is most frequently seen in pairs, or solitary. It is tamed as a protector of poultry-yards; but if not sufficiently fed, is apt to help itself to a chicken or duckling.—Another species of secretary appears to exist in more northern parts of Africa, as about the Gambia; and a third, more widely different, in the Philippine islands. See *illus.*, LARKS, ETC., vol. VIII.

SECRETARY. The chiefs of the executive departments of the United States government, forming the cabinet, are termed secretaries, except in the case of the post-office department and the department of justice. They are the secretary of state, whose charge is the foreign relations of the government; the secretary of the treasury, who has charge of the national finances, including the customs revenue; the secretary of war, who has in charge the U. S. army and controls its disposition—under the direction of the president, who is commander-in-chief of the army and navy; the secretary of the navy, who bears a similar relation to the naval force; the postmaster-general; the attorney-general; the secretary of the interior, in whose charge are the Indian tribes, government lands, pensions, patent office, railroads, and bureau of education; and the secretary of agriculture. All are appointed by the president and confirmed by the senate. They report annually, and as much oftener as required, to the president, who lays their reports before congress. The salary of each of the heads of departments is \$8,000 per annum. Each is subject to removal by the president, whenever in the judgment of the latter the interest of the government shall so demand. During the administration of President Johnson the power of removal was taken from him by what was known as the tenure-

of-office act, which was applied in the case of secretary of war Stanton, whom the president had removed from office. The difficulty resulted in the impeachment of the president and his acquittal; when secretary Stanton resigned. See UNITED STATES.

SECRETARY OF EMBASSY or of LEGATION, the principal of the persons belonging to the suite of an ambassador or envoy. Secretaries of embassy or legation hold their commission immediately from the sovereign, who nominates them in general only to ministers of the first and second rank. They are therefore considered a species of public minister; and independently of their attachment to an ambassador's suite, they enjoy in their own name all the privileges and protections of the diplomatic character. They are generally presented in person to the foreign sovereign at whose court they are accredited. The functions of a secretary of embassy or legation consist principally in assisting the chief in the business of the embassy. Moser (*Versuch Th.* iii. p. 94) says: "An ambassador is often only like the hands of a watch, while his secretary resembles the works." Secretaries of embassy and legation occupy the post of ambassadors and envoys during the absence of their ministers. A secretary of embassy or legation must not be confounded with the private secretary of an ambassador appointed and paid by him, who has none of the privileges and immunities above mentioned.

SECRETARY OF LEGATION. The title of the second diplomatic official accompanying full missions to foreign courts, and who fulfills the duties of the minister in his absence. Such officials are sent by the United States to the courts of Great Britain, Russia, France, Spain, Germany, Austria-Hungary, Italy, Japan, China, Mexico, Brazil, and Turkey; at the last-named court, supplying also the functions of consul-general. The foreign countries having secretaries of legation at Washington are: Argentine Republic, Austria-Hungary, Belgium, Brazil, Chili, Colombia, France, Great Britain, Hayti, Mexico, Peru, Russia, Spain, Sweden and Norway, Turkey, China, Japan.

SECRETARY OF THE SENATE. This official is elected by the U. S. senate, and his duties are those which usually appertain to the secretary of any organized body: viz., to keep the journal of the senate, communicate messages to the house of representatives and the president, etc. From the first session of congress in 1789 to 1850, there were but four secretaries: Samuel Alyn Otis, who served more than 25 years; Charles Cutts, who served 11 years; Walter Lowrie, who served 11 years; and Asbury Dickins, who served 14 years. Col. John W. Forney was secretary of the senate 1861-69, when he resigned and was succeeded by George C. Gorham. The present incumbent (1891) is Anson G. McCook.

SECRETARY OF STATE, an ancient and important office in the government of England. The oldest record of its existence is in the reign of Henry III., when John Maunsell is described as "secretarius noster." Prior to the restoration, the holder of this office was generally styled the "king's chief" or "principal secretary;" he had the custody of the king's signet, and discharged his duties with the assistance of four clerks. Two secretaries are said to have been first appointed toward the close of the reign of Henry VIII. The office, always one of influence, gradually grew in importance. On the union of 1707, Anne added a third secretary of state for Scotland, which office, however, was soon done away with. In the reign of George III. there were at first but two secretaries; for a time there was a third for America, but his office was abolished by statute in 1782. While the secretaries were two in number, both equally directed home affairs; to the one were committed the foreign affairs of the northern, to the other of the southern department. Irish affairs belonged to the province of the elder secretary.

There are now five principal secretaries of state, who are respectively appointed for home affairs, foreign affairs, war, the colonies, and India. They are all appointed by the sovereign by the mere delivery of the seals of office, without patent, and are always members of the privy council and of the cabinet. Though each has his own department, he is considered capable of discharging the duties of the others; a member of the house of commons, if removed from one secretaryship to another, does not thereby vacate his seat. For the American Secretary of State, see SECRETARY.

SECRETION is the term employed in physiology to designate the process of *separation* of those matters from the nutritious fluids of the body which are destined not to be directly applied to the nutrition and renovation of its organized fabric, but (1) to be either at once removed as injurious to its welfare, or (2) to be employed for some ulterior purpose in the chemical or physical processes of the economy itself, or to exert some kind of action upon other beings. For this definition of secretion considered as a process we are indebted to Dr. Carpenter; but the reader must bear in mind that the term is also very commonly used in another sense—namely, to designate the *products* which are thus secreted. In this latter sense, it is customary to speak of the biliary, urinary, or cutaneous secretion, when the bile, urine, and sweat are indicated.

Although it is impossible to divide with strictness the secreted products (as many physiologists have attempted to do) into the *excrementitious* and the *recrementitious*—that is to say, into (1) those which have no further function to discharge in the animal body, and which, if not excreted, would act as poisons, and (2) those which are subservient to further uses in the system—yet we may group them according to the preponderance of their excrementitious or recrementitious character. Dr. Carpenter approves of this mode of arrangement, and proposes that those secretory processes should be arranged in the first division in

which the depuration of the blood is obviously the chief end, while those should be classed under the second in which the ulterior purpose of the separated fluid would seem to be the principal occasion of its production; and he further suggests a subdivision of this second group, according as this ulterior purpose is connected with the operations of the economy itself, as in the case of the tears, and the saliva, the gastric juice, etc., or is destined to act on some other organism, as is the case with the secretion of the testes, the milk, etc. The organs which yield the various secretions are termed glands (q.v.); but neither the form nor the internal arrangement of the parts of a gland have any essential connection with the nature of its product; the true process of secretion, under whatever form it may present itself, being always performed by the intervention of cells (q.v.). For a notice of the mode in which the cells are arranged in various glandular structures, the reader is referred to the articles **GLANDS**; **KIDNEY**; **LIVER**; **MUCOUS MEMBRANES**, etc.

We shall now briefly notice the causes which render the due performance of the functions of secretion essential to the well-being of every animal. 1. Nearly all the solids and fluids of the body are liable to continuous decomposition and decay in consequence of their peculiar chemical composition. There is an obvious necessity that the products of incipient decomposition should be carried off and replaced by newly-organized matter. 2. The exercise of the various animal functions is essentially destructive to the structures by which they are accomplished; every operation of the muscular or nervous system appearing to require, as a necessary condition, a disintegration or breaking up of a certain portion of their tissues, probably by an act of oxidation. Hence, for the due preservation of health, the disintegrated or effete matters must be removed and their place supplied. 3. When more food is taken than the wants of the system require, all that is not appropriated to the reparation of the waste, or to the increase in the weight of the body, must be thrown off by the excretory organs without ever having become converted into organic tissue. If this excess were not speedily removed by the excretory organs, the current of the blood would speedily become poisoned.

The following may be regarded as a tolerably complete list of the substances which are produced within the organisms of man and the lower animals by the disintegration of its various tissues, and which are met with in one or other of the products of secretion: 1. Products of secreting processes, including *a*, the biliary acids and the products of their disintegration; *b*, the pigments of the bile; *c*, pigments allied to those of the bile and blood, viz., hæmatoidin and melanin; *d*, cholesterol and its allies; *e*, the sugars and allied bodies. 2. Products of the actual regressive metamorphosis of tissues—*a*, nitrogenous amide-like bodies, such as leucine, tyrosine, creatine, creatinine, allantoin, cystin, guanine, sarcine, xanthin, and urea; *b*, nitrogenous acids, as hippuric, uric, and cynuric acids; *c*, indifferent nitrogenous bodies, such as the pigments occurring in the urine; and excretine; and *d*, non-nitrogenous acids, as acetic, benzoic, butyric, carbonic, formic, lactic, oxalic, succinic, and valerianic acids. Some of these products, however, only occur in the secretions in cases of disease.

SECRETIONS, VEGETABLE. In the vegetable kingdom the term *secretion* has a wider application than in the animal kingdom, and all substances which have been formed by the action of cells upon the compounds taken up as food (such as carbonic acid, water, and ammonia)—whether these substances form a part of the tissues of the plant, or are thrown out upon its surface—are equally considered as secretions. All the important vegetable secretions are compounds of carbon, hydrogen, oxygen, and nitrogen; sulphur being also present in some cases; and according to their functions they may be classed in two great divisions—viz., (1) nutritive or assimilable secretions, and (2) non-assimilable or special secretions.

1. The *nutritive* secretions are those substances which, having been formed within the plant, are used in forming its structures and constructing its general mass. The chief substances in this class are cellulose, the varieties of starch, the varieties of sugar, the oils, and the so-called protein or albuminous bodies. The composition of these substances is extremely varied; thus many of the volatile oils or essences contain only carbon and hydrogen; the sugars, starches, and cellulose contain carbon, hydrogen, and oxygen, and are named tenary compounds; while the protein bodies contain carbon, hydrogen, oxygen, and nitrogen, and in some cases sulphur.

2. The *non-assimilable* secretions are only found in certain parts of the plant, and they receive their name from their never being converted into the nutritive secretions. The principal members of this class are the coloring matter of plants (chlorophyll and its modifications); the substances which, when extracted from plants, are of service as dye-stuffs (the *chromogens* or color-formers of recent chemists); the organic acids, which constitute a somewhat numerous group, and of which oxalic acid (occurring in rhubarb, sorrel, etc.), tartaric and racemic acids (in the grape), malic acid (in the apple and gooseberry), citric acid (in the orange, lemon, lime, and red currant), gallic acid (in the seeds of the mango), meconic acid (in the opium poppy), and tannic acid (in the bark of the oak, elm, etc.), may be taken as well-known examples; the vegetable alkalies or alkaloïds, such as morphia, strychnia, quinia, etc.; the volatile oils; and the resins.

SECRET SERVICE, under the U. S. government, a department or bureau, not created by law, nor recognized by specific appropriation for its cost. Its duties are not

defined, and vary with the necessities of the occasion which may create them. During the war of the secession this service was largely extended; its chief was a soldier with the rank of a brig.-gen. of volunteers, and its power and authority—under the government—were practically unlimited. This service is, since the close of the war, represented by the bureau of special agents of the revenue department of the U. S. treasury. These officials are charged with the investigation of suspected frauds in the collection of the revenue, either through fraudulent invoices, undervaluation, or false appraisement. They are authorized to inspect invoices and other records in the various custom-houses; and to investigate the books of mercantile houses, and require them to be brought into court for examination, on suspicion of fraudulent importation of goods.

SECRET AND BENEVOLENT SOCIETIES. See ASSOCIATIONS, SECRET AND BENEVOLENT.

SECRET WRITING, or SYMPATHETIC INK. See INK.

SECRE^{LE}, a small t. of British India, in the n.w. provinces, 3 m. n.w. of Benares, contains most of the civil establishments, the military cantonments, and the residences of most of the British population connected with Benares. The residences or bungalows are handsome and substantial, but are scattered about among the groves and gardens which surround the military cantonments. The latter, which are capable of containing three or four regiments, are traversed by a small stream, the Burnah Nuddee. Among the public buildings are a Christian church and chapel, a court of justice, the treasury, the jail, and a mint. Secrole, which may be considered as the British quarter of Benares, was the headquarters of the Benares division of the Bengal army, and here, on June 4, 1857, the 37th Bengal Native infantry, the 13th Irregular cavalry, and a portion of the Loodianah Sikhs, in all 2,000 men, mutinied; but being charged by col. (afterward brig.-gen.) Neill at the head of 240 men of the Madras and Queen's armies, and a few faithful Sikhs and Irregulars, they were compelled to take to flight with the loss of about 200 men, after killing two of their own British officers and two privates of Neill's force.

SECTION, in architecture, the delineation of buildings on a vertical plane through any part of them—as a *plan* is the horizontal projection. Sections are of great use in practice in showing the thickness of walls, the construction of floors, roofs, etc., and the forms and dimensions of every part of the interiors of buildings. Sections may also be used to show the furniture, drapery, etc., of rooms. These are called furnished sections. All moldings, cornices, etc., are drawn in section or profile, full size.

SECTOR, in *geometry*, is a portion of a circle included between two radii and the intercepted arc of the circumference. The area of a sector is equal to that of a triangle whose base is equal in length to the intercepted arc, and whose perpendicular height is equal to the length of the radius.

SECTOR, in *practical mechanics*, an instrument of considerable utility in rough mathematical drawing, consists of two strips of wood, ivory, or metal jointed together like a carpenter's foot-rule. It is absolutely necessary for the correctness of the instrument that the center of the axle of the joint should be accurately at the inner corner of each slip, so that it will always be the vertex of a triangle of which the inner edges (and consequently any of the corresponding pairs of lines drawn from the joint obliquely along the rule) form the two sides. These oblique lines, which are drawn on both sides of the instrument, and converge from the extremities of the two strips to the center of the joint, are graduated in different ways, so as to give, on each limb, a line of equal parts, a scale of chords, scales of sines, tangents, and secants, a line of polygons, etc. (all of which are graduated from the center of the hinge, which is their zero point), besides a number of common scales on the blank portions of the sector. The special use of this instrument is in the finding of a fourth proportional to three given quantities, and the operation is performed as follows: If the fourth proportional to 18, 16, and 81 is required, find the graduation indicating 18 on each limb; then obtain, by means of a pair of compasses, the length from 0 to 16, and open out the instrument till the two 18 points are as far apart as the distance given by the compasses; then, by measuring with the compasses the distance of the two graduations indicating 81, and applying the compasses to the scale, we obtain the fourth proportional required. It will be seen that this instrument merely supplies a mechanical mode of constructing two similar isosceles triangles, one of which has all its sides, and the other has only its equal sides given, the other side or base, which is formed by the sector, and read off by aid of the compasses and scale, being, from the very nature of similar triangles, the fourth proportion required. This instrument becomes more inaccurate as the angle formed by the limbs increases. The sector is said to have been invented by Guido Ubaldo about 1568, though Gasper Mordente of Antwerp describes it in 1584, and attributes its invention to his brother Fabricius in 1554. It was described by several German and English writers in the same century, and again by Galileo, who claimed to have invented it in 1604.

SECULAR CLERGY. See CLERGY.

SECULAR GAMES, a Roman festival held at distant but indefinite periods, and deriving the name from the word *seculum* (an age). They were also called *ludi Tarentini*, from Tarentum, a place in the Campus Martius, where the games were held. Proserpina and Dis were the divinities in whose honor the festival was instituted; but the

worship was not confined to them. It is said that the *ludi sæculares* were celebrated only eight times under both the republic and the empire.

SECULARISM is the term applied to a system of ethical principles begun to be advocated about 1846 by G. J. Holyoake. As the system has a considerable number of adherents, and comes not seldom into public notice, a brief account of its leading doctrines is here given. As in similar cases, we allow a believer in the doctrines to speak for himself.

The secular is defined as that which pertains to this life, and is treated as a thing apart; as independent of, rather than as necessarily opposed to, any other mode of thought and duty. Secularism, as regards opponents, claims that to ignore is not to deny. As the geometrician ignores chemistry or metaphysics, without a thought of denying them, so secularism, which concerns itself with this world, refuses to be held as conflicting with that "other-worldliness," which, if demonstrable, must be based on an experience to which secularism makes no pretension, and toward which it considers itself to incur no responsibility. Secularism commences by laying down the proposition that intelligent sincerity is sinless. It does not maintain that even intelligent sincerity is errorless, but that it is without conscious guilt, even when it is, as it may be, dangerously mistaken. The conscience thus educated, thought may be intrusted to inquiry, and the search for truth may be begun.

Secularism takes the term free thought as expressing the central idea which it inculcates. It defines free thought as the unrestricted application of the powers of the intellect to any subject—the absence of any threat or penalty, legal, spiritual, or social, for the exercise of thought. The free thought it inculcates is not lawless thought; it is guided by methods of logic, limited by evidence checked at every step by experience, which is omnipresent, and corrected by the results of science. Free thought is not the rebellion but the judicial action of the understanding. Reason—the faculty of following the pathway of facts—does not despise intuition, nor instinct, nor the voice of nature, nor authority; it uses, but revises them; it does not pretend to be infallible, but to be the best arbiter we have. To the conception of free thought is also necessary the free publication of opinion, for no one could profit by the thought of other minds unless it was freely communicated. Hence the diffusion of thought becomes an obligation on each thinker, and silence or supineness a social crime. Again, free thought that would command respect must be submitted to free criticism. Thought is often foolish, often mischievous, and sometimes wicked, and he alone who submits it to free criticism gives guaranties to society that he means well, since by criticism comes the exposure of false or foolish opinions; and the right of criticism is the sole protection of the public from error. Free thought must end in the free action of opinion, since he thinks to no purpose whose thought is inapplicable to conduct, and he withholds the sign of his own sincerity who does not unite his thought with action. Such is that education in free thought which secularism attempts.

It holds that skepticism is the pathway to affirmative truth. So far from being a crime, skepticism is scrutiny. So far from being the end, it is the beginning of inquiry—the first condition for the recognition of unknown truth. He who would be master of his own mind, and know what is in it, and who would have no principles there but those which are pure, true, and reliable, must refuse to believe anything until he is compelled to believe it; it being no more safe to keep one's mind open to all notions, than to keep one's door open to all comers. It is clear that the use of free thought may be a nuisance, a terror, or an outrage, unless courtesy takes care of it. Therefore secularism provides that advocacy shall be directed to the exposure of error and the elucidation of truth, without moral imputation upon those whose opinions are controverted; and contends that all advocacy, wanting in consideration toward others, shall be regarded as a crime against free thought. The quality of the thought, and not the motive of it, is the proper and sufficient subject of discussion.

Secularism further imposes upon the action of free thought the limit that every one shall concede to others the liberty he claims for himself, and shall permit to others, and shall recognize in each individual, "liberty of action in all things by which others are neither injured nor damaged." Secularism, regarding the one object of all free thought as the attainment of truth, finds in the study of nature its immediate sphere of exercise. Free thought is prompted by a desire to fathom the knowable; and nature and human life are the immediate sources of truth and duty, which it most concerns man to master. Therefore, respect for this life, respect for pure physical conditions, respect for the moral capacity of human nature, are conditions of secular belief. Secularism is not committed to denying that there is other good—it does not meddle with that question; it says whether there be other good or not, the good of the present life is good, and it is good to seek that good. It holds that the secular is sacred, and seeks "to find that material condition in which it shall be impossible for man to be deprived or poor." It does not say that all things are material, or that there are no spiritual agencies; it does not enter upon these propositions, but confines itself to showing that there are material agencies in this life, whatever else there may be, and that these, as far as they can be discovered, are the calculable forces of the world, which cannot be neglected without folly or hurt, and that it is wisdom, mercy, and duty to attend to them. Without enter-

ing upon the question of the interference of Providence, secularism contends that science is practically the providence of life; that conscience is higher than consequence; that deliverance from calamity is more merciful than any system of consolation which only acts when calamity has occurred; and that it is not the pursuit of happiness, but the performance of duty, which is the end of life. Secularism proceeds in the path of positive philosophy, not seeking for errors but for truth; not busying itself with negations but with affirmations. In sacred writ it seeks for guiding truth and thought which commends itself to reason and experience, accepting the intrinsically true, without entering upon the vexed questions of inspiration or authenticity. Whatever principles secularism inculcates they are affirmative in their nature, relate to the welfare of humanity, and are determined by considerations purely human.

There is unquestionably a vast outlying class in every European country, and especially in our Indian territories, who are without the pale of Christianity. They reject it, they dislike it, or they do not understand it. Secularism is intended for these, and for all who find theology indefinite, or inadequate, or deem it unreliable. The object of secularism is to afford these classes a knowledge of principles addressed to their common reason and intelligence, by an appeal to principles of a secular nature, common to humanity in every state and clime. It may be a misfortune that the principles of theism, or the acceptance of the Bible, cannot be rendered promptly acceptable to them. Since, however, this is not the case, it must be of advantage to interest them in rules calculated for the moral guidance of their conduct. Upon these, Christianity may be, if shown to be tenable, subsequently superinduced. The principles of secularism are intended to constitute an education of the working classes, which begins with their reason, grows with their intelligence, and ends only with death.

Secularism is not an argument against Christianity, it is one independent of it. It does not question the pretensions of Christianity; it advances others. Secularism does not say there is no light or guidance elsewhere, but maintains that there is light and guidance in secular truth, whose conditions and sanctions exist independently, act independently, and act forever. Secular knowledge is manifestly that kind of knowledge which is founded in this life, which relates to the conduct of this life, conduces to the welfare of this life, and is capable of being tested by the experience of this life. Geometry, algebra, botany, chemistry, navigation, political economy, ethics, are secular subjects of instruction (distinct albeit from secularism, which includes the education of the conscience). They are founded in nature, they relate to the uses of this life, promote the enjoyment of this life, and can be tested by personal experience. That which is secular can be tested in time; that which is theological is only provable after death. If a sum in arithmetic is wrong, it can be proved by a new way of working it; if a medical recipe is wrong the effect is discoverable on the health; if a political law is wrong, it is sooner or later apparent in the disaster it brings with it; if a theorem in navigation is erroneous, delay or shipwreck warns the mariner of the mistake; if an insane moralist teaches that adherence to the truth is wrong, men can try the effects of lying, when the disgrace and distrust which ensue soon convince them of the fallacy; but if a theological belief is wrong, we must die to find it out.

The standard of secularism is utilitarian. Utility is made the test of right, not the utility which is sensual and selfish, but that which takes into account the highest attributes and noblest aspirations of humanity (see UTILITARIANISM). It is not the agent's own happiness, but the happiness of others which the utilitarian is bound to promote. The adoption of this rule makes intelligence a necessity. Secularism is not skeptical. It seeks everywhere positive truth, and regards doubt as a difficulty and a danger. It is not infidel, for that is a state of mind treacherous to the truth, and truth is the first thing to which secularism teaches allegiance. It is not atheistic, atheism being alien to secularism, which concerns itself with the affirmative. Secularism might call itself religious, if it were allowable to use the term without including some distinctive theory of theism, which is equally excluded from the subject-matter of secularism, as not coming within the region of positive knowledge. Nothing in secular morals can be insisted upon with effect, save those statements which appeal to the common experience, and with which you can dare the judgment of mankind; but if that may be called religious, which appeals to demonstrative intelligence, which addresses itself to the conscience, which inculcates love, and truth, and justice; which claims service and endurance from all men; which places happiness in duty, and makes the service of humanity the one object of life, and the source of consolation in death, then secularism may be so defined, and in this sense it has been described in the following definitions:

Secularism is the religion of the present life: it teaches men to seek morality in nature, and happiness in duty; guiding the conduct and educating the conscience of those who do not know, or who, from conscientious conviction, stand apart from Christianity. Secularism teaches a man to acquit himself well in this world as the purest act of worship, to study the truth, to judge by reason, to regulate human interests by considerations purely human, and to act on that rule of utility which conduces to the greatest good of others; thus endeavoring to deserve another life by the unceasing, unrelenting pursuit of duty in this.

SECUNDERABAD (more correctly Sikandarābād), a large t., and an important British military cantonment in the Nizam's dominions, India, 6 m. n. of Haidarābād. On the

n.e. are two singular granite hills, large, hemispherical in shape, completely isolated, and having on their summits the tombs of fakirs, which are visited by a great number of pilgrims each year. The cantonment consists of a curved, irregular street, 3 m. in length, with the officers' houses ranged on either side. There are numerous barracks, and good hospital accommodation. There are numerous tanks in the vicinity, and the water is good. The mean annual temperature is $81^{\circ} 30'$, and the climate is unhealthy—though less so now than formerly—during the rainy season. Pop. of Secunderabad, 40,000.

SECURITY, in law, means some deed affecting real or personal estate, the object of which is to secure the payment of a primary debt. Such are bonds (q.v.) and mortgages (q.v.).

SEDALIA, city and co. seat of Pettis co., Mo.; on the Missouri, Kansas and Texas, the Missouri Pacific, and the Sedalia, Warsaw, and Southwestern railroads; 95 m. e. of Kansas City. It was laid out from a farm in 1861, was a U. S. military post during the greater part of the civil war, and was chartered as a city in 1893. The city contains the George R. Smith college (M. E.), named after the founder of the city, Sacred Heart school, convent and school of sisters of St. Joseph, public high school, several schools of music, public library, City and Missouri, Kansas, and Texas railroad hospitals, Forest, Association, and Fisher's lake parks, Brown springs, about 30 churches, U. S. government building, and extensive railroad locomotive and car shops. There are gas and electric lights, electric street railroads, national and state banks, and daily, weekly, and monthly periodicals. Pop. '90, 14,068.

SEDAN, a manufacturing t. and frontier fortress of France, in the dep. of Ardennes; pop. in '91, 20,292. In 1646 Colbert founded here the first of his famous cloth-factories; and the fabrics of Sedan have now a European reputation, and employ many hands. There is also extensive industry in various branches of metallurgy; and there are coal and iron mines in the vicinity. The fortress of Sedan has played a considerable part in military history; and it has recently become noted as the place where (Sept. 2, 1870), Napoleon III. and an army of 90,000 men surrendered to the Prussians.

SEDAN CHAIR, a portable covered vehicle for carrying a single person, borne on two poles by two men. The name is derived from the town of Sedan, in the n. of France, where this species of conveyance is said to have been invented. It is said that the duke of Buckingham was in the practice of using one in the reign of James I., a proceeding which gave general offense, it being made matter of public remark that this royal favorite used his fellow-countrymen to do the work of beasts. The general introduction of sedan chairs into England dates from 1634, about the same period that hackney coaches came into use. Sedan chairs were largely used during the greater part of last century, being found very well adapted for transporting persons, in full dress, to public and private entertainments. Not only were there numerous public conveyances of this kind in London and all considerable towns, but the owner of every large mansion had his private sedan handsomely fitted up.

SEDATIVES are medicines which exert a direct or primary depressing action upon the vital powers, without inducing any subsequent excitement. The diseases in which sedatives are employed are chiefly those of over excitement of the nervous and circulating systems; and as some of the members of this class (hemlock, for example) act directly on the nervous system, while others (foxglove, for example) more immediately act upon the heart, it is necessary to be able to determine the kind of sedative suitable for each individual case. Inflammatory fever presents all the conditions in which sedatives are likely to be of service. "The excited heart, elevated temperature, hard and unyielding pulse, and the disordered state of the special nerves call for the administration of remedies fitted to appease their excited energy, and the great improvement which, in such a case, follows the use of *blood-letting*, *tartar emetic*, and *digitalis* bears evidence to the correctness of our practice." (Ballard and Garrod's *Elements of Materia Medica*, p. 11.) The following are the most important members of this class: aconite, carbonic acid (applied locally in cases of irritable bladder or womb, or to painful ulcers), chloroform (especially when inhaled), conium, digitalis, hydrocyanic acid, and tobacco.

SEDGE. See CAREX.

SEDGWICK, a co. in n.e. Col., touching Nebraska, formed 1889 from part of Logan; about 650 sq. m.; pop. '90, 1293. The South Platte river crosses the northern part. Co. seat, Julesburg.

SEDGWICK, a co. in s. Kansas; drained by the Arkansas, Little Arkansas, and Ninne Sciah rivers; on the Atchison, Topeka, and Santa Fé, and several other railroads; about 1008 sq.m.; pop. '90, 43,626, chiefly of American birth. The surface is level. The soil is fertile. The principal productions are wheat, corn, and cattle. Co. seat, Wichita.

SEDGWICK, an American family, distinguished in politics, law, and literature.—THEODORE SEDGWICK, statesman and jurist, was b. at Hartford, Conn., May, 1746. He was descended from Robert Sedgwick, a maj. gen. of the army of Cromwell. Educated at Yale college, he adopted the profession of law, and removed to the western part of Massachusetts, where he was a member of the colonial assembly. Though a loyalist in

feeling, at the outbreak of the American revolution he took the part of his country, and served as an aid-de-camp to Gen. Thomas in the unfortunate expedition to Canada. In 1785 he settled at Stockbridge, Mass., where his descendants now reside, became a member of the continental congress, and took an active part in suppressing Shays's rebellion. He remained in congress as representative or senator until 1799, and in 1802 was appointed judge of the supreme court of Massachusetts, and was a prominent member of the old federalist party, and an early opponent of slavery. He died at Boston, Jan. 24, 1813.—THEODORE SEDGWICK, American lawyer and writer, son of the preceding, was b. at Sheffield, Mass., Dec., 1780. Like his father he was bred to the legal profession, and in 1801 settled at Albany, N. Y., where he remained in successful practice until 1821, when he retired to Stockbridge, advocating, as a popular speaker, the interests of a scientific agriculture, free trade, temperance, and antislavery, and wrote *Public and Private Economy, Illustrated by Observations made in Europe* in 1836-37 (3 vols. 12mo, New York, 1838). He died of a stroke of paralysis, after making a public speech at Pittsfield, Mass., Nov. 7, 1839.—SUSAN RIDLEY SEDGWICK (1789-1867), wife of the preceding, descended from an old English border family, and proud of her relationship to bishop Ridley, was a daughter of William Livingston, governor of New Jersey. She is the author of *The Morals of Pleasure* (1829); *The Young Emigrants*, and *The Children's Week* (1830); *Allan Prescott*, a novel (1834); *Alida* (1844); and *Walter Thornaley*, a novel, written in 1859, when she was more than 70 years old.—CATHERINE MARIA SEDGWICK, American authoress, daughter of judge Theodore Sedgwick, and sister of the second Theodore Sedgwick, was b. at Stockbridge in the year 1789. In 1822 she published *A New England Tale*, which was followed, in 1824, by *Redwood*, a novel so popular that it was reprinted in England, and translated into several of the continental languages. This was followed by *Hope Leslie*, or *Early Times in Massachusetts* (1827); *Clarence*, a *Tale of our Own Times* (1830); *Le Bossu*, and *The Linwoods* (1835); and these by a series of popular stories, illustrating morals and domestic economy, entitled *The Poor Rich Man and the Rich Poor Man*; *Live and let Live*; *Means and Ends*; *Home*, etc.; and contributed a "Life of Lucretia Maria Davidson," to Sparks's *American Biographies*. In 1841, on her return from Europe, she published *Letters from Abroad to Kindred at Home*; in 1845, *Wilton Harvey and other Tales*; followed by *The Morals of Manners*, and *Married or Single?* She also edited and was an active contributor to some of the leading American periodicals. Died July 31, 1867.—THEODORE SEDGWICK, an American lawyer, son of the second Theodore Sedgwick, was b. at Albany Jan. 27, 1811, was educated at Columbia college, and admitted to the bar in 1833; and, excepting three years spent at Paris, as secretary of the American legation, continued in successful legal practice until 1850, when he again visited and made an extensive tour in Europe. He steadily declined to engage in politics, and refused all offices tendered him, until, in 1858, he accepted that of United States attorney for the southern district of New York. Among his writings are, a standard *Treatise on the Measure of Damages*; a work on *The Interpretation and Application of Statutory and Constitutional Law*; the *Memoirs of William Livingston*, his grandfather; *The Life and Works of William Leggett*, and various occasional addresses. He died at Stockbridge, Dec. 9, 1859.

SEDGWICK, ADAM, LL.D., 1785-1873; b. England; educated at Cambridge, where he became professor of geology in 1818. He made a geological trip through Scotland in 1827; and in 1829 through the continent with Murchinson, with whom he afterward had a sharp dispute in regard to the use of the words Cambrian and Silurian. He was an opponent of the theory of evolution. Among his works are *Discourse of the Studies of the University of Cambridge* (1850); and *A Synopsis of the Classification of the Paleozoic Rocks* (1855).

SEDGWICK, JOHN, 1813-64; b. Cornwall, Conn.; graduate of West Point, 1837; brevetted capt. for service in the Mexican war, and brevetted maj. for the attack on the San Cosme gate. He rose through successive grades to maj.gen. of volunteers, 1862. In 1837-38 he was in the Florida war, and engaged in the Cheyenne, Utah, Kiowa, and Comanche expeditions. In 1862 (war of the secession) he was assigned to duty on the upper Potomac, distinguished himself at Fair Oaks and Glendale; was wounded at the latter, and at Antietam, and on his recovery was placed in command of the 9th army corps. He led the 6th corps in the Chancellorsville campaign, carried the heights at Fredericksburg, and did good work at Gettysburg. In 1863 he was thanked in a general order for the capture of a confederate division at the Rapidan. He went through the hard fights of the Wilderness at the head of his corps, and was fatally shot at Spottsylvania.

SEDGWICK, ROBERT, d. 1656; b. England; settled at Charlestown, Mass., 1635, and for many years represented that town in the legislature. With John Winthrop, jr., he established, 1643-44, the first furnace in this country. Under authority from Cromwell, who afterward made him maj.gen., he drove the French from Penobscot in 1654, and accompanied the expedition which captured Jamaica.

SEDITION (Lat. *seditio*, from *se*, apart, and *ire*, to go), a general name given to such offenses against the state as fall short of treason. In the law of England it is not a strictly technical word. Writing, publishing, or uttering words tending to excite subjects to insurrection, though not urging them to rebellion or total subversion of the government, come under this denomination. There are various English statutes (as 39

Geo. III. c. 70; 57 Geo. III. c. 19; and 60 Geo. III. and 1 Geo. IV. c. 8) directed against particular acts of sedition, such as seditious libels, and seditious meetings or assemblies, which are punishable as misdemeanors. Act 36 Geo. III., directed against all seditious practices and attempts tending to high treason, is extended to Ireland by 11 Vict., and additional provisions are added to it. By this latter act the compassing or devising, either to depose the queen; to levy war against the queen, for the purpose of changing her majesty's measures, or constraining or overawing parliament; or to move any foreigner to invade the queen's dominions, is made felony, punishable by transportation for life, or for a period not less than seven years, and that even though the facts should amount to treason.

In Scotland sedition is distinguished from leasing-making (q. v.), in so far as the object of the latter is to disparage the private character of the sovereign, while the former crime is directed against the order and tranquillity of the state. The punishment of sedition, formerly arbitrary, is now restricted to fine and imprisonment.

SEDLEY, Sir CHARLES, 1639-1701; b. England; went to London after the restoration, and stood high in the favor of Charles II. He was a town wit whose chief poetical pieces are brief amatory poems. He was a man of dissolute habits, and was once fined £500 for making a speech naked to a mob from a balcony. He opposed James II., it is said, on account of the intrigue of the latter with his daughter.

SEDUCTION is the carnal knowledge of an unmarried woman, without force and with her consent. When the wrongful act is committed with a married woman, it gives to her husband a right of action against the adulterer for "criminal conversation." If the wrong be committed forcibly and against the will of the female, it constitutes the crime of rape (q. v.); but if she be conscious of the act and of sufficient age to voluntarily consent, and actually do consent, no rape is committed, even though her consent be obtained by fraud or false representations. Since she has consented to the wrong, the woman herself has no right of action for the injury against her seducer. But if she be a servant to either her father, or mother, or any other person, her master or mistress can sue the seducer for any loss of services occasioned by the illicit act. Since a father has a right to the services of his minor daughter, it is held in the United States that he may recover damages against her seducer, whether she be living in his own family or in the service of another person at the time when she is seduced. But in England, if such minor daughter be out at service with another at that time, the father is given no right of action. When the daughter is an adult, the rule, in both countries, is that she must be in the actual service of her father to enable him to maintain such an action. If the father be dead, the same rules apply to the right of action by the mother. Very slight acts of service will be sufficient ground in either case for such an action. While the general rule is that, in actions by masters for loss of services, compensation for the actual injury sustained is all that can be recovered; yet, in cases of seduction, it is the common practice, permitted by the courts, for juries to give damages greatly beyond that amount. Especially is this practice sanctioned where the father or mother sues, and the conduct of the defendant has been base and heartless. It is now provided by statutes, in some of the American states, that the woman may herself have an action against her seducer; but this right is generally confined to cases in which the seduction has been perpetrated under promise of marriage. A few of such statutes give to the head of the family the right to sue without the necessity of showing any loss of services whatever.

SE'DUM, a genus of plants of the natural order *crassulaceæ*, having the calyx in 4 to 8 (usually 5) deep segments, which often resemble the leaves, the same number of spreading petals, twice as many stamens, and 4 to 8 (usually 5) germens, each with a nectariferous scale at the base. The species are numerous, with succulent, often roundish, leaves; and pretty, star-like flowers. Many of them grow on rocks, whence the English name **STONE-CROP**. They are natives of the temperate and cold parts of the northern hemisphere; some are British. They have no important uses; some are refrigerant, others are acrid. Among the British species is *S. telephium*, popularly called **ORPINE**, sometimes used as a diuretic; and *S. acre*, the most common, whose brilliant yellow flowers adorn the tops of old walls, the débris around quarries, etc.

SEE (Lat. *sedes*, a seat), in ecclesiastical use, properly signifies the seat or chair (*cathedra*), sometimes also called "throne," of a bishop. Popularly, however, and indeed by universal usage, it is employed to designate the city, and thence, at least in popular language, the entire diocese, in which the seat of the bishop is placed, and over which, consequently, his episcopal jurisdiction extends. Sees have always been fixed, at least in their primitive establishment, in some city or considerable town; and it is to be observed that the name of a see is always taken not from the district governed by the bishop, but from the city or town. Sees in *partibus infidelium* (q. v.) still retain their ancient names, although in very many cases not merely the cities themselves, but even all traces of the Christian religion, in the sites upon which they anciently stood, have disappeared. In the Roman church the pope alone establishes sees, and alters their distribution and their local limits and boundaries; but these changes are not made except in extreme cases (such as that of the French revolution) without the consent of the actual bishop. In the Anglican church this is done by the authority of the legislature.

SEE'BACH, MARIE, b. Riga, 1834; daughter of an actor; was educated at Cologne for the opera. She appeared in vaudevilles at Nuremberg and Cassel; and made a great success at Hamburg as Gretchen in Goethe's *Faust*, and as Clärchen in *Egmont*. She performed at Hanover, 1856-65. In 1866 she removed to Berlin with her husband, Albert Niemann, and in 1871 visited the United States. She d. '97.

SEED, in phanerogamous plants, that part which may in some measure be regarded as corresponding to the perfectly developed impregnated *ovum* of animals, and which is the utmost effort made by the plant for the reproduction of its species. It is the perfectly developed ovule (q.v.). While one cell of the interior of the nucleus (see OVULE) greatly enlarges, the other cells are forced back; the interior of the nucleus thus becomes a cavity (the embryo sac), and fecundation (q.v.) now taking place by means of the pollen, the primary cell is formed, which grows to form the *embryo*. As the fertilized ovule is developed into the ripe seed, the *foramen* (see OVULE) or *micropyle* closes completely; but its place is commonly marked in ripe seeds by a little cicatrix. In the ripe seed the integuments of the ovule, more fully developed, form the covering (*spermoderm*); while the *nucleus* is either entirely converted into the embryo (q.v.), or also into an inorganic cellular mass called the albumen (q.v.), which is, in an economical point of view, the most important part of many seeds, as of those of the cereal grasses. The embryo, which, with respect to the reproduction of the plant, is the most essential part of the seed, is developed to various degrees in different plants—which is also the case in different animals, and even in those of the same class, as in mammalia; but in general, the *radicle* may be distinguished in it—the beginning of the root or descending axis of the new plant, and the *plumule* or *gemmule*—the beginning of the stem or ascending axis, as well as the *cotyledon* or cotyledons, provided for the nourishment of the new plant in its youngest stage. When the embryo is accompanied with albumen, it is sometimes completely inclosed in it; sometimes it lies at the side of the albumen; and sometimes it surrounds the albumen like a ring, or even completely. Sometimes, but rarely, the embryo is not well developed in ripe seeds, so that its parts cannot be distinguished, as in the *orchideæ*, in which it appears as a roundish or oval, uniform, little cellular mass. In germination the embryo breaks through the covering of the seed, and develops itself into the new plant.

Seeds are either *sessile* or *stalked*. The stalk is of various length, and is formed of the *funiculus* or *umbilical cord*; the place at the base of the seed, by which it is affixed to the inside of the fruit, or to the end of the *funiculus*, being called the *umbilicus* or *hilum*. When the seed is perfectly ripe, it has no further need of connection with the parent plant, and the *funiculus* dries up, leaving the *hilum* a mere scar.

Besides being inclosed in a capsule, or in a succulent fruit, etc., the most essential parts of the seed have coverings of their own, which are reckoned as belonging to the seed itself. Its general covering is called the *spermoderm* (Gr. *sperma*, seed, *derma*, covering), which consists of an external membrane, the *testa* (Gr. shell) or *episperm* (Gr. *epi*, upon) and an internal membrane, the *endopleura* (Gr. *endon*, within, *pleura*, side). Sometimes there is within the episperm a fleshy layer, called the *sarcosperm* (Gr. *sarx*, flesh). The aril (q.v.) is a comparatively rare additional covering.

The seeds of phanerogamous plants afford characters which distinguish two great classes as *monocotyledonous* and *dicotyledonous*. Very few plants have more than two cotyledons (seed-lobes). It is the case, however, with some of the *coniferae*. Cryptogamous plants are also designated *acotyledonous*, as having no seed-lobes; and the name *spore* (q.v.) is distinctively given to their seeds.

Seeds retain their vitality very long; but the time seems to be very various with the seeds of different plants, and in different circumstances. The grains, or seeds of cereal grasses, are probably excelled in this respect by none; grains of maize found in the tombs of the incas have been made to vegetate; and also, it is said, grains of wheat taken from Egyptian mummies, although of this there is some doubt. After the great fire of London in 1666, plants not previously common sprang up abundantly on the waste ground; certain plants previously unknown there are sure to appear after a fire in the American forests; and instances are constantly occurring of a deep trenching of land or a turning up of soil by railway or other operations, producing a crop of some kind of plant previously unknown or rare in the locality. Thus the writer of this article has seen plants of the milk thistle appear on rubbish thrown out from the foundation of a house in Peeblesshire, where there was no other milk thistle in the neighborhood. And in Paisley Moss, in Renfrewshire, willows spring up in the ditches which are cut for drainage, from the surface of the soil which underlies the moss or peat. It is difficult to conjecture how long the seeds, in such cases, may have retained their vitality.

Exposed to the air, however, seeds generally lose their vitality in a few years. Some kinds retain it much longer than others. Seeds which abound in fixed oil seem to lose it more quickly than others.

In conveying seeds from one part of the world to another, and through great diversities of climate, it is desirable to have them as closely secured from the air as possible. But it has been found that of seeds brought from the botanic garden at Calcutta to Scotland, round the cape of Good Hope, with no other care than would be used in sending a parcel from a seed-shop to a neighboring garden, the greater part readily vegetated.

SEELAND (Dan. *Sjælland*), the largest and most important island of Denmark, lies between the Cattegat and the Baltic, and is separated by the sound from Sweden, and by the Great Belt from Fünen. Length, 78 m.; extreme breadth, 70 m.; area, 2713 sq. m.; pop. '90 (including the two small islands Möen and Samsoe), 722,000. The surface is almost flat; the coasts, which are rockbound on the s.e., are indented by bays and fiords, the chief of which is the Roeskilde-Isefiord in the north. The rivers are small, the largest being only 50 m. long; there are several lakes, and all the waters abound in fish. The island contains several beech-forests, is exceedingly fruitful in corn, and breeds excellent horses and cattle. Agriculture and cattle-breeding are the principal employments of the inhabitants. The chief place is Copenhagen (q.v.), the capital of the country, and from this city lines of railway traverse the island.

SEELEY, JOHN ROBERT, b. London, 1834; educated at Cambridge. In 1863 he was appointed professor of Latin in University college, London, and in 1869 professor of modern history at Cambridge. His *Ecce Homo*, published anonymously in 1865, excited great interest and called forth much discussion and many replies. Among his other works are an edition of Livy; *Roman Imperialism*; a *Life of Stein*; *Natural Religion*; *Goethe Reviewed after Sixty Years* (1893); *Growth of British Policy* (1895). He died in 1895.

SEELYE, JULIUS HAWLEY, S.T.D., LL.D., born in Conn., 1824; graduated at Amherst college, 1849; studied theology at Auburn seminary, and Halle, Germany; was ordained and became pastor of the First Reformed church, Schenectady, N. Y., in 1853. In 1858 he was elected professor of mental and moral philosophy in Amherst college. In 1872 he visited India and lectured to educated Hindus on the truths of Christianity. The lectures were published in Bombay, and also in Boston in a volume entitled *The Way, The Truth, and The Life*. He published also *Christian Missions*; also *Sermons and Addresses*, among them, a Massachusetts "Election Sermon;" contributed articles for reviews, and translated Schwegler's *History of Philosophy*. In 1874 he was elected a representative to congress as a candidate independent of both political parties, and was a zealous advocate of reform in the civil service and in the mode of dealing with the Indian tribes. In 1876 he was elected president of Amherst college, still retaining his professorship, and resigned in 1890. He was a faithful worker in education, and an earnest and powerful preacher. He died in 1895.

SEELYE, LAURENUS CLARK, D.D., b. Conn., 1837; graduated at Union college in 1857; studied theology at Andover seminary, 1857-59; at Berlin and Heidelberg, 1860-62. After traveling in Europe, Palestine, and Egypt, he was ordained and settled pastor of the North Congregational church, Springfield, Mass., in 1863; was elected professor of Greek and Latin in Amherst college in 1865; became president of Smith college for young women at Northampton in 1874, which position he still fills. He has contributed to several periodicals.

SEEMANN, BERTHOLD, PH.D., 1825-71; b. Hanover, Germany; became a distinguished naturalist, and in 1847 sailed with an English expedition which made the tour of the world and was absent for nearly five years. In this tour and in explorations of the Feejee islands and Nicaragua, 1860, he made many scientific discoveries of value. He published an account of the voyage of the *Herald*, and of three arctic cruises in search of Franklin; *Botanical Researches* (1852-57); and several other volumes.

SEER. See PROPHECY.

SEET'ZEN, ULRICH JASPER, 1767-1811; b. Holland; educated at the university of Göttingen, and in 1802, with the aid of the duke of Gotha, set out for the exploration of Asia and Africa. He spent 15 months at Aleppo learning Arabic, and traveled through Syria and Palestine, making valuable scientific collections. In 1805 he explored Lebanon and the country e. of the Dead sea. After exploring upper Egypt, and securing a collection of MSS. for the museum of Gotha, he visited Mecca in the disguise of a Mohammedan. He reached Mocha in 1810, and is said to have been poisoned in 1811. His diary and maps, recovered in 1815, were published in 3 vols. (Berlin, 1854).

SEGGAR, a vessel used by potters to protect delicate articles from the too fierce action of the fire in the kiln. See POTTERY.

SEGMENT (Lat. *segmentum*, a part cut off), is, in geometry, a portion cut off from a circle by a line, or from a sphere by a plane. When the angle subtended at the center of a circle by the segment, and the radius, or when the chord of the segment and its height, are known, the length of the arc of the segment and its area can be determined with as much accuracy as the circumference and area of the whole circle. See SPHERE.

SEGNO (Ital. sign), a word used in musical notation in connection with the marks of repetition. When a part is to be repeated, not from the beginning, but from some other point, the mark S: is placed over the point where the repetition is to commence, and the words *Dal Signo* (or *d. s.*) are written at the close of the part to be repeated.

SE'GO, an important t. of western Africa, capital of the state of Bambarra, stands on the Nigar, here called the Joliba, in lat. 13° 5' n., long. 7° west. Its streets, which are winding, have a breadth of from 24 to 26 ft., and are extremely clean. The houses are built of clay, and are flat-roofed, and the royal residence differs from the other dwellings

only in size. The country in the vicinity is well cultivated, and the town is the seat of considerable traffic. Mungo Park, from whom we derive almost all the knowledge we possess of Segó, here first beheld the Joliba. Pop. estimated at 30,000.

SEGORBÉ, a city of Spain, in the modern province of Castellon de la Plana, on the right bank of the Palancia, in a valley renowned for the beauty of its scenery and for its amazing fertility, 26 m. n.w. of Valencia. It is the seat of a bishop and cathedral. Brandy distilling is carried on to a great extent, and there are flour and paper mills, oil works, etc. Some black marble is found. Pop. '87, 7440.

SEGOVIA, an interesting city of Spain, capital of the modern province of the same name (see CASTILE), stands on the Eresma, by which it is nearly encircled, 32 m. n.n.w. of Madrid. It occupies the top of a rocky knoll, 3150 ft. above sea-level, is surrounded by picturesque walls with round towers, and consists of narrow uneven streets, with old, quaint, and stately houses, parish churches, and convents. The Alcazar, or castle, is perched on the w. extremity of the rocky height, and was originally Moorish, but repaired magnificently in 1452-58. The cathedral of Segovia, a noble specimen of florid Gothic, is one of the finest in Spain. The present building was begun in 1525. The square cupola-crowned tower is 330 ft. high, and the prospect from this elevation is superb. The grand aqueduct of Segovia, supposed to have been built in the time of Trajan, is believed to be the most important Roman structure in Spain. It consists of two tiers of 320 arches, the one resting upon the other, 937 ft. long and 102 ft. high. Wool-scouring and the manufacture of woolen fabrics are languidly carried on. Pop. '87, 14,389.

Segovia was a place of importance during the time of the Romans; was the seat of immense cloth-manufactures in the time of the Moors, and was frequently the residence of the kings of Castile and Leon. Charles I. of England lodged at the Alcazar, Sept. 13, 1623, and supped on "certain trout of extraordinary greatness." The unresisting town was sacked in 1803 by the French under Frere.

The province of Segovia has an area of 2714 sq.m., and a pop., 1887, of 154,457.

SEGUIN, EDOUARD, 1812-80; b. France; educated at the colleges of Auxerre and St. Louis in Paris; studied medicine and surgery under Itard (q.v.), and was afterward associated with Esquirol. At Itard's suggestion Dr. Seguin, soon after graduating in medicine, undertook the training of a few idiot children. See IDIOCY. In 1846 he published a treatise entitled *Traitement moral, Hygiène et Education des Idiots et des autres Enfants arriérés*, which has always been the standard text-book on the subject. After the revolution of 1848, Dr. Seguin came to the United States, visiting the idiot school in South Boston and the institution for feeble-minded youth at Barre, Mass., and then went to Albany, where Dr. Wilbur was organizing an experimental school which developed into the New York state idiot asylum at Syracuse, and rendered valuable assistance. He then went to France, and returned with his family in 1851, settling at Portsmouth, Ohio, to practice medicine. But he visited and taught at various idiot institutions in Connecticut, Ohio, Pennsylvania, and New York, and for a time was at the head of the Pennsylvania institution. He again went to France in 1858; returned to the United States again in 1859, and settled in practice at Mount Vernon, N. Y., from whence he removed to New York city in 1863, publishing *Idiocy and its Treatment by the Physiological Method* in 1866. He has also published *Theorie et Pratique de l'Education des Idiots* (Paris, 1842); *Hygiène et Education des Idiots* (Paris, 1843); *Images graduées à l'Usage des Enfants arriérés et Idiots* (Paris, 1846); *F. R. Periere, premier Instituteur des Sourds et Muets en France* (Paris, 1847); *Historical Notice of the Origin and Progress of the Treatment of Idiots* (translated by J. S. Newberry, M.D., 1852); *New Facts and Remarks Concerning Idiocy* (1869); an edition of *Wunderlich's Medical Thermometry*, with large additions (1871). He invented a physiological thermometer, which is in use among physicians.

SEGUR, the name of a French family, distinguished both in arms and letters. It is of Limousin origin, and was known there, it is said, as far back as the 9th century. The first, however, that specially merits notice was HENRI FRANÇOIS, comte de Segur (born 1689, died 1751), an able French gen. in the war of the Austrian succession. His son, PHILIPPE HENRI, marquis de Segur (born 1724, died 1801), fought in the seven years' war, obtained the dignity of *maréchal de France* in 1783, and outlived in his retirement the stormy scenes of the revolution. The eldest son of this Philippe Henri was LOUIS PHILIPPE, comte de Segur (born 1753, died 1830), a vivid dashing sort of man, for some years ambassador at the court of St. Petersburg, and a great favorite with Catharine II. Of impressionable fancy, full of enthusiasm for the "philosophers," the "reign of reason," and the "new ideas" generally, he hailed the great revolution with delight, but took no prominent part in it. His public career during the empire was respectable, but not brilliant; but one notices with satisfaction that he retained in extreme old age that love of liberty that marked his early years; the last act of his life being an eulogium on the revolution of July. As a writer, Segur has in wonderful perfection the national graces of style and spirit. Among his numerous writings are: *Pensées Politiques* (Par. 1795); *Histoire de Frédéric Guillaume II.* (Par. 1800); *Contes, Fables, Chansons et Vers* (Par. 1801); and *Mémoires ou Souvenirs et Anecdotes* (Par. 1824). He left two sons, OCTAVE and PHILIPPE PAUL, the latter of whom (who was born in 1780)

was a gen. of the first empire, took part in the fatal expedition to Russia in 1812, and wrote the story of the campaign, *Histoire de Napoléon et de la Grande Armée pendant l'année 1812* (Par. 2 vols., 1824). The work has had an immense success, and has been translated into almost all the languages of Europe. Other works of the comte Paul Philippe de Segur are: *Lettre sur la Campagne du Général Macdonald dans les Grisons* (Par. 1802); *Histoire de Russie et de Pierre le Grand* (Par. 1829); *Histoire de Charles VIII., Roi de France* (Par. 1834); etc.

SEGU RA, a river in the s.e. of Spain, rises in the Sierra de Segura, and after an e.s.e. course of about 150 m., enters the Mediterranean 19 m. s.w. of Alicante.

SEICENTIS'TI, a name given to the Italian authors of the 17th c.; and, as that century was a period of literary decadence, the name has become a type for bad taste.

SEIDENBUSH, RUPERT, b. Munich, Bavaria, 1830. He became a Benedictine monk in the U. S.; attained the rank of abbot in 1867; and in 1875 was consecrated to a titular bishopric, and was appointed vicar apostolic of Northern Minnesota.

SEIDL, ANTON, conductor, b. in Budapest, Hungary, May 7, 1850. After receiving his musical education at the Leipsic Conservatory, he went to Bayreuth in 1872, where he was employed by Wagner to copy the score of the *Nibelungen Trilogy*. He assisted at the Wagner Festival in Bayreuth in 1876, and through Wagner's influence became conductor at the Leipsic Opera House from 1879 till 1882. Subsequently he traveled in Europe conducting a series of Nibelungen operas, and in 1883 he became conductor of the Opera House in Bremen. In 1885 he succeeded Dr. Leopold Damrosch as conductor at the Metropolitan opera house in New York. Seidl is one of the greatest and most renowned of Wagnerian conductors, and is a thorough musician. He became musical director of the New York philharmonic society in 1891.

SEID LITZ POWDERS are composed of 120 grains of tartrate of soda and potash, and 40 grains of bicarbonate of soda reduced to powder, mixed and inclosed in a blue paper, and 35 grains of powdered tartaric acid in a white paper. The contents of the blue paper are dissolved in from half a tumbler to a tumbler of water, and those of the white paper are then stirred in. The mixture should be taken while the effervescence from the liberation of the carbonic acid is still going on. These powders act as an agreeable and mild cooling aperient. If a stronger dose is required, either an increased quantity of the powder may be used, or a little sulphate of magnesia (about a dram) may be added.

SEIGNIOR, GRAND, a name sometimes given to the sultan (q.v.) of Turkey.

SEIGNIORAGE is the profit, exclusive of the cost to the manufacturer, based upon the difference between the cost of the bullion used and the price at which the coin is issued after deducting the loss of bullion in the process of coining. Thus 1000 ounces of silver at the market rate, for instance, \$0.75 per ounce in gold, would be \$750. This will coin 1292 pieces, upon which the seigniorage will be \$542, less the loss of bullion in manufacture, say about \$6, making \$536. The cost of manufacture of 1292 pieces is \$39, thus showing a net seigniorage of \$497 upon an expenditure of \$750 in gold for 1292 silver dollars.

SEINE (anc. *Sequana*), one of the most important rivers of France, rises near Mont Tasselot, in the middle of the dep. of Côte-d'Or, and after leaving the northern boundary of that dep., flows w.n.w. through the deps. of Aube, Seine-et-Marne, Seine, Seine-et-Oise, Eure, and Seine-inférieure, to the English channel, which it reaches at Havre, after a course of 482 miles. It passes the towns of Troyes, Méry—where, 350 m. from its mouth, it becomes navigable—Corbeil, Paris, Elbeuf, Rouen, and Havre. The source of the river is about 1420 ft. above the level of the sea; but below Paris its current is slow, and its course to Rouen is marked by numerous windings. Its lower course also is banked by steep hills, which, while they are picturesque, are everywhere cultivated. The principal affluents are, from the right, the Aube, Marne, and Oise; from the left, the Yonne, Loing, Essonne, and Eure.

SEINE, the metropolitan dep. of France, completely inclosed by the dep. of Seine-et-Oise, is a portion of the former province of L'Ile-de-France, and its arrondissements are Paris (the capital), St. Denis, and Sceaux. It is at once the smallest and the most populous dep. in the empire; its area is 183 sq. m.; its pop. '96, 3,340,514, abt. 18,194 to the sq. mile. From s.e. to n.w. the dep. is traversed a distance of 37 m. by the winding Seine, which receives the navigable Marne at Charenton, and the Bièvre at Paris. The ground has been much cultivated, and quarries of building stone and gypsum are found.

SEINE-ET-MARNE, an inland department in the n. of France, is bounded on the e. by the department of Seine-et-Oise, and forms a portion of that wide basin in the middle of which stands Paris. Area, 2215 sq. m.; pop. '96, 359,044. The department owes its name to the two chief streams that water it, and of which the Seine flows through the southern and the Marne through the northern part. There are no mountains. Timber is grown in every part; and among the forests is that of Fontainebleau. The soil is generally fertile. Of cereals wheat is the principal crop. The capital is Melun, and the arrondissements are Melun, Coulommiers, Fontainebleau, Meaux, and Provins.

SEINE-ET-OISE, a department in the n. of France, incloses the metropolitan department of Seine (q.v.). Area, 2164 sq. m.; pop. '96, 669,098. The great rivers are the Seine and Oise, which have numerous affluents. Extensive plains occupy the southern

districts; but in the n. the country is much broken, and picturesque valleys and great forests occur. The soil is fertile, and, owing to the vicinity of the capital, the amount of produce is great. Oats is the principal cereal; and wheat, sugar-beet, forage roots, cider apples and vegetables are important. The industries include silk, wool, and flax spinning, hosiery making, flour milling, sugar refining, and the manufacture of iron and copper articles and locomotives. Among the minerals are several fine varieties of stone and fine clays. In addition to the usual branches of manufacture, porcelain is largely made at the famous Sèvres (q. v.) factories. The department is divided into the arrondissements of Versailles, Corbeil, Étampes, Mantes, Pontoise, and Rambouillet, and the capital is Versailles.

SEINE-INFÉRIEURE, a maritime department of France, bounded on the n. w. by the English channel, and on the s. by the department of Eure. Area, 2330 sq. m.; pop. '96, 837,824. The Seine flows through the southern districts; but a number of important though small streams flow n. w. across the department, and fall into the channel. The range of the hills of Caux extends from e. to w., and to the s. of it are rich pasture-lands, watered by the Seine and its affluents. Husbandry flourishes chiefly in the middle and in the e. districts. Wheat, oats, sugar-beet, colza, and cider apples are cultivated. Some cheese is made and some peat obtained. There are cotton, wool, and flax manufactures. There are iron, copper, locomotive and machinery works. The coasts are formed of chalk-cliffs, varying in height from 200 to 650 feet. The arrondissements are Dieppe, Le Havre, Rouen, Neufchâtel, and Yvetot. The capital is Rouen, which communicates with Dieppe by a direct line of railway.

SEI'SIN. See SASINE.

SEISS, JOSEPH AUGUSTUS, D.D., b. Md., 1823; pastor of a Lutheran church in Baltimore; in 1869 became pastor of St. John's church, Philadelphia. He is an earnest advocate of Millenarianism, and a vigorous and copious writer; has published *Lectures on Hebrews*; *The Last Times*; *Threatening Ruin*; *The Baptist System Examined*; *The Gospel in Leviticus*; *Day of the Lord*; *A Miracle in Stone, or the Great Pyramid of Egypt*; *Voices from Babylon, or the Records of Daniel the Prophet*; *The Gospel in the Stars*. He was one of the editors of the *Lutheran and Missionary*, and *The Prophetic Times*.

SEISMOGRAPH, SEISMOMETER, or SEISMOSCOPE, THE, is an instrument so contrived as to leave some record of an earthquake shock. The earliest of which any account is given is one invented by a Chinese named Chôko, A.D. 136. It consists of a sphere-shaped copper vessel some eight feet in diameter, having a column passing through the top, so arranged as to move in eight directions. In the sides of the sphere are eight dragon heads, each holding a ball in its mouth, while underneath each head is a frog with open mouth to catch the ball if it drops. Within the sphere is an arrangement that causes any vibration of the column to knock one or more of the balls, and thus the direction of the earthquake is shown. The later inventions also register the force and duration of the shocks. The first self-registering instrument was one devised by Mr. Mallet in 1846. An elaborate electro-magnetic instrument constructed by Prof. Palmieri has done good service in the observatory at Mt. Vesuvius, while the latest and most complete is the one recently invented by Messrs. Guy and Milne, which records both the horizontal and the vertical motion as well as the period of duration.

SEISTAN, or SISTAN, a region in eastern Persia and southwestern Afghanistan, between lat. 30° and 32° n., and long. 60° and 62° e. The surface slopes from the neighboring table-lands to this region. Its boundary toward Afghanistan and Beloochistan was determined in 1870-72 by an English boundary commission, which gave Seistan proper (mostly west of the Helmand) to Persia, and outer Seistan (to the e. and s.e. of Seistan proper) to Afghanistan. The Persian district consists for the most part of plains, and is not fertile, except along the banks of the streams. It is inhabited by Persians and Beloochs, and the population is estimated at 150,000. It abounds in relics of antiquity, and before the ravages of Tamerlane, in the 14th c., was one of the most important of the Persian provinces.

SEJANT, or ASSIS (Fr.), in heraldry, is the term of blazon applied to a beast in his usual sitting posture. A lion borne in full face, with his fore-paws extended sideways, is blazoned sejant affronté, as in the crest of Scotland.

SEJANUS. See TIBERIUS.

SELA'CHIANS. See PLAGIOTOMI.

SELBY, a market t. and river-port in the West Riding of Yorkshire, on the right bank of the Ouse, 20 m. e. of Leeds. The ancient Gothic cross which adorns the market-place, and the character of the architecture of the houses attest the age of the town. The magnificent parish church, 306 ft. long by 60 ft. wide, is part of an abbey founded by the Conqueror in 1068. Means of communication by railway and canal are abundant. Pop. '91, 6022.

SELDEN, JOHN, an illustrious English scholar and lawyer, was b. Dec. 16, 1584, near Worthing, in Sussex; studied at Hart hall, Oxford, for three years, and then removed, first to Clifford's inn, London, and afterward to the inner temple, for the pursuit of law. It was here that his great learning began to attract attention, and won for him the friendship of Camden, Usher, sir Robert Cotton, and sir Henry Spelman. Selden wrote his first treatise, which related to the civil government of Britain previous to the Norman conquest, and was entitled *Analecton Anglo-Britannicon*, in 1606, when only 22 years of age, though it was not published till nine years later. In 1610 appeared his *Janus Anglorum Facies Altera* (English translation, 1683), giving an account of the common and

statute law of English Brittany to the death of Henry II. ; and in 1614 was published his *Titles of Honour*, a work still regarded as of high authority on the subject of which it treats. Three years later appeared an erudite, but, judging from what Le Clerc says, not a very critical or well-digested, work on the Syrian gods, especially in their connection with the Old Testament, entitled *De Diis Syriis, Syntagma Duo*. Next year, however, he excited great indignation among the clergy by his *Treatise of Tythes*, in which he endeavored to prove that tithes are not due by divine right under Christianity, but solely because the law has imposed them. Selden was assailed with diatribes, animadversions, additional animadversions, historical vindications of the *ius divinum* of tithes, etc.; but it does not appear that the arguments were very convincing to Selden. In 1621 he suffered a brief imprisonment for advising the parliament to repudiate king James's doctrine that their privileges were originally royal grants; in 1623 he was elected member for Lancaster, and from this period till his death he took a considerable part in public affairs, yet not such as to materially interfere with the continuance of scholarly pursuits. Selden's political position is somewhat difficult to define. There is no doubt that he was sincerely attached to the cause of the parliament, and as sincerely opposed to the views of the court party and the king. But he was above all things a constitutional lawyer, and derived his ideas of the rights of the subject from the history of the nation, and not from religious fanaticism or metaphysical considerations. Still, he "loved his ease," according to Clarendon (who has painted Selden's portrait in his usual fine style), and so let things be done without protest, of which he did not approve. Personally, he was rather a favorite with king Charles, on account of his learning and moderation. In 1630 he was committed to the tower for his activity in opposing the policy of the court, and remained a prisoner for four years, when he was released through the favor of archbishop Laud and the lord treasurer; in 1640 he was chosen member for the university of Oxford; and now, when the struggle between the king and the nation began to grow dead-earnest, he was occasionally suspected of not being zealous enough by such as were themselves perhaps over-zealous. He threw the weight of his learning and argument into the scale against the bishops (toward whom, like Milton and other lay-champions of freedom, he felt a peculiarly strong antipathy), when the question came up as to their tenure of seats in parliament; he was one of those who drew up the articles of impeachment against Laud; he sat as a lay-member in the assembly of divines at Westminster, 1643, and perplexed his clerical colleagues sadly. In 1644 he was elected one of the twelve commissioners of the admiralty; in 1646 the sum of £5,000 was voted to him by parliament, in consideration of his services and sufferings; in 1647 he was appointed one of the university "visitors," and always used his influence to moderate the tyranny of his fanatical colleagues. After the execution of Charles (of which it is certain he strongly disapproved, as both unlawful and inexpedient), he took little share in public matters; and when requested by Cromwell to answer the *Ekkon Basilike*, he refused. His death occurred Nov. 30, 1654, in the house of Elizabeth, dowager-countess of Kent, with whom he had long lived in such intimacy that people said they were married. The principal writings of Selden, besides those already mentioned, are: *Marmora Arundelliana* (1629); *De Successionibus in Bona Defuncti secundum Leges Hebræorum* (1634); *De Successione in Pontificatum Hebræorum, Libri Duo* (Leyd., 1638); *De Jure Naturali et Gentium, juxta Disciplinam Hebræorum* (1640); a work more learned than critical (like most of Selden's biblical productions, who thought far too much of the opinions of the Rabbins); and *Uxor Hebraica*; *Mare Clausum* (1635), a reply to Grotius's *Mare Liberum* (treatises which originated in a dispute between the English and Dutch concerning the herring-fishery upon the British coast, to which the Dutch laid claim); *De Anno Civili et Calendario Judaico* (1646); *De Synedrüs et Præfecturis Hebræorum* (1650 et seq.); besides a great variety of posthumous works, of which the most famous, and also the most valuable, is his *Table-talk* (recorded and published by his amanuensis, Richard Milward, in 1689), of which Coleridge says (with considerable exaggeration, however): "There is more weighty bullion sense in this book than I can find in the same number of pages of any uninspired writer." Selden was highly esteemed by all his great contemporaries, both royalist and parliamentary, on account of his integrity, candor, and vast erudition; but his moral courage or enthusiasm was not remarkable (except when tilting at the bishops—then, like Erasmus on the monks, he was quite heroic); and, on the whole, as compared with Milton, he occupies the level which Erasmus did in relation to Luther. Selden's works were collected and published at London in three folio volumes (1726).

SEL D'OR, a salt employed in photography, originally to aid in fixing and improving the image on a daguerreotype-plate, and more recently for toning positive paper-proofs. It is a double hyposulphite of gold and sodium, the constitution of which is expressed by the formula $\text{Au}_2\text{S}_2\text{O}_3 + 3\text{Na}_2\text{S}_2\text{O}_3 + 4\text{H}_2\text{O}$. It is formed when 1 part of chloride of gold in solution is added to 3 parts of hyposulphite of soda, also in solution. The hyposulphite of soda should be always in excess during the mixture, a condition which is secured by adding the chloride of gold to the hyposulphite of soda, and not *vice versâ*. The salt so formed is precipitated in fine, white, crystalline needles on the addition of alcohol to the above mixed solutions; these are collected on bibulous paper, and gently dried for use. Adulterations in the commercial article, which are unfortunately only

too common, may be ascertained by precipitating, igniting, and weighing the gold contained in the sample it is desired to test. Nitric acid free from chlorine will decompose this salt and precipitate its contained gold in the metallic form.

SELENĒ, the Greek name of the goddess of the moon; called also *Mene*, and in Latin, *Luna*. Her myth is differently told, but the most common account makes her a daughter of Hyperion and Theia, and sister of Helios (the sun) and Eos (the dawn); as sister of Helios, also called *Phoibos* (the shining one), she had the name of *Phœbe*, and latterly was identified with Artemis (see *DIANA*), though the identification was never quite exact, as Artemis always retained her reputation for chastity, while Selenē had 50 daughters by her lover Endymion, and several by Zeus, one of whom was called *Erse* ("the dew"), indicating the original physical character of the myth. In art the two are always distinct. Selenē is represented by the poets with long wings and a golden diadem riding across the heavens in a chariot drawn by two white horses, cows, or mules.

SELENITE (Gr. *Selenē*, the moon), a transparent and beautiful variety of gypsum (q.v.), white, or tinged with green, gray, or yellow. It receives its name from its peculiar moon-like luster. It is often crystallized in six-sided prisms, sometimes in lenses, and twin crystals and quadruple crystals occur. It is found in common gypsum, in rock-salt, in the blue clay of the s. of England, etc. There is in the British museum a splendid group of crystals of selenite presented by the late prince Albert. Selenite is easily cut, and is capable of being split into extremely thin plates, which are flexible, although not elastic. It was used by the ancients for some of the purposes for which we use glass. The Romans imported it from Spain, Cyprus, Cappadocia, and Africa. The hot-houses of Tiberius were covered with it, and Pliny mentions that it was used in the construction of beehives by those who wished to watch the operation of the bees. It is used for making the finest kind of stucco, and the most delicate pastel colors. When burned, and perfectly dry, its powder is used for cleansing and polishing articles of gold and silver, precious stones, and pearls.

SELENIUM (Se, old equiv. 39.5—new 79; sp. gr. 4.30) is an element having two forms. In the *amorphous* form at ordinary temperature, it is a solid of a dark-brown color, and when broken, presents a conchoidal vitreous fracture; thin splinters of it are, however, of a dark-red tint when seen by transmitted light. It is tasteless and inodorous, a non-conductor of electricity, except at temperatures above 175° C. When very slowly cooled from the fused condition, the structure is *granular* or *crystalline* (sometimes called "metallic"). Crystalline S. is of a dull leaden color; opaque even in thin films, and is a conductor of electricity at ordinary temperatures. Its resistance to the passage of an electric current diminishes up to the point of fusion; increasing as the S. becomes liquid. Crystalline S. is remarkably sensitive to light; and its electrical resistance varies very much according to its exposure to light, being much less in the light than in the dark. It was in virtue of this property that the experiments were made which led, in 1880, to the discovery of the Photophone (q.v. under *SPECTROPHONE*). It is solid up to 422.6° F. (217° C.), when it fuses into a fluid, which boils at 1292° F. (700° C.), emitting an inodorous vapor of a deep yellow tint. When heated in the air, selenium does not very readily take fire, but it is combustible, and burns with a blue flame, emitting an odor which resembles that of bisulphide of carbon or garlic.

Selenium is of rare occurrence in nature; it is chiefly found as a selenide in combination with lead, silver, copper, or iron; but it has also been discovered in sulphur from the Lipari isles, and in certain sulphides of iron. Only one oxide of selenium is definitely known, the dioxide SeO₂. Berzelius states that a lower oxide is formed when selenium is burned in the air, and that it is the cause of the peculiar garlic-like odor.

Selenium forms two oxyacids—selenious acid, H₂SeO₃, and selenic acid, H₂SeO₄. With hydrogen it forms H₂Se, seleniureted hydrogen, or hydroselenic acid, a colorless gas, which resembles, but is more offensive than sulphureted hydrogen.

Selenium was discovered in 1817 by Berzelius, who named it from *Selenē*, the Gr. for "the moon," because in many respects it resembled tellurium, which is named from *Tellus*, the Lat. for "the earth."

SELEUCIA, the name of seven ancient cities of Asia, situated in Syria, Pisidia, Pamphylia, Cilicia, Caria, and Mesopotamia, and founded during the earlier existence of the dynasty of the *Seleucidæ* (q.v.). The most distinguished of these were: 1. **SELEUCIA PIERIA**, founded by Seleucus Nicator, on the sea-shore, about 4 m. n. of the mouth of the Orontes, and strongly fortified. It was the sea-port of Antioch, and became of great importance during the wars between the Seleucidæ and the Ptolemies for the possession of Syria. It rapidly declined under the Roman dominion. The ruins have been fully explored and described in modern times by Pococke (*Observations on Syria*) and Chesney (*Royal Geographical Society's Journal*, vol. viii.). Its once magnificent port is in such an extremely good state of preservation as to require few repairs to render it serviceable; and the remarkable tunnel of 1088 yards in length, which was excavated out of the solid rock, and formed the only communication between the city and the sea; and the remains of its triple line of walls, of its citadel, temples, amphitheater, necropolis, etc., all attest the former importance and splendor of the city.—2. **SELEUCIA ON THE TIGRIS**, was also built by Seleucus Nicator, on the w. bank of the Tigris, 40 m. (according to Strabo 33) n.e. of Babylon, which was despoiled to supply materials for the construction of the new city. Situated in a district of great fertility, commanding the great

trading routes of Assyria, Babylonia, and western Persia, it rapidly rose to great wealth, and splendor, supplanted Babylon as the capital of the eastern portion of the Seleucide monarchy, and when in the acme of its greatness, contained a population of more than 600,000. Even in Strabo's time, it was larger than Antioch in Syria, the greatest commercial emporium of Asia; and down to the period of its final destruction, the number of its inhabitants is said to have never fallen below half a million. During the decline of the Seleucide monarchy, it became independent, and formed, from its wealth and splendor, an irresistible bait to the robber-tribes of southern Armenia and Media, who partially plundered it on more than one occasion. But its position on the confines of Persia, which gave it its greatness, was also the cause of its destruction; for when the Seleucide monarchy was swallowed up by the Romans, and the long and desolating struggle between the latter and Persia had commenced, Seleucia, placed between two fires, was speedily brought to ruin. It was burned by Trajan (116 A.D.), and a few years afterward, by Lucius Verus; and when visited by Septimius Severus was as desolate as the mighty city it had supplanted. The emperor Julian, on his expedition to the east, found the whole country round it converted into a vast marsh, the haunt of innumerable beasts of chase and wild-fowl, and the city itself completely deserted.

SELEUCIDÆ, the dynasty of kings to whom fell that portion of Alexander the Great's immense and ill-compacted monarchy which included Syria, a large portion of Asia Minor, and the whole of the eastern provinces.

SELEUCUS I., surnamed **Nicator**, the first of this line, was the son of Antiochus, a distinguished officer in the service of Philip of Macedon, and was born 365 B.C. He was one of the conspirators against Perdiccas, and in the second partition of the provinces of Alexander the Great's kingdom, obtained Babylonia, to which with the aid of Antigonus, he subsequently added Susiana; but a misunderstanding with that powerful chief having arisen, Seleucus took refuge in Egypt (316 B.C.). The victory gained by Ptolemy over Antigonus's son, Demetrius, at Gaza, having laid open the route to the east, Seleucus returned to his satrapy, amid the joyous congratulations of his subjects (312 B.C.). From Oct. 1. of this year (the date of Seleucus's return to Babylon) commences the *era of the Seleucidæ*. Having next recovered Susiana, he conquered Media, and extended his power to the Oxus and Indus. Of his campaign against Sandrocottus (q.v.), there are few details extant. In 306 B.C. he assumed the regal title; and four years afterward joined the confederacy of Ptolemy, Lysimachus, and Cassander, against the now formidable Antigonus, deciding the battle of Ipsus (301 B.C.) chiefly by his cavalry and elephants. Being now, after Antigonus's death, the most powerful of Alexander's successors, he obtained the largest share in the conquered kingdom, a great part of Asia Minor and the whole of Syria falling to him. Toward the close of his reign, war broke out with Demetrius (now his father-in-law), and afterward with Lysimachus, king of Thrace and the other part of Asia Minor, both contests terminating in the defeat and death of his opponents, and being followed by the acquisition of the rest of Asia Minor. He was assassinated (281 B.C.) by Ptolemy Ceraunus. Of Seleucus's personal character, little can be gathered from the fragments of his history which remain to us; according to Pausanias, he was the most upright of Alexander's successors, unstained by those crimes which have foully blotted the characters of the others; but of his consummate generalship and great political talents we have sufficient proof. He pursued with great zeal the plan of "Hellenizing" the east, by founding numerous Greek and Macedonian colonies in various parts of his dominions; he also built numerous cities, several of which—as Antioch in Syria, and Seleucia on the Tigris—rose to be among the most populous and wealthy in the world.—After the reigns of **ANTIOCHUS I.** (q.v.), and **ANTIOCHUS II.** (q.v.), **SELEUCUS II.** (246–226), surnamed **CALLINICUS**, obtained the throne; but having, at the instigation of his mother Laodice, murdered his step-mother Berenice, an Egyptian princess, he was driven from his kingdom by Ptolemy Euergetes (q.v.). However, he recovered his throne on Ptolemy's withdrawal; and though defeated in a great battle with the Egyptians, he succeeded in maintaining his hold of Syria and most of Asia Minor against both the Egyptians and his younger brother Antiochus, who exercised independent authority over part of Asia Minor. Antiochus was at a later period wholly defeated in Mesopotamia, and soon after murdered by robbers. Seleucus undertook a great expedition against the revolted provinces of Parthia and Bactria, but was totally routed by Arsaces I., king of Parthia; while, on the n.w., several provinces were wrested from him by Attalus, the king of Pergamus.—His sons, **SELEUCUS III.** (226–223), surnamed **CERAUNUS**, and **ANTIOCHUS III.** (q.v.), "the great," were his successors, the latter being the first of the dynasty who came into collision with the Romans.—**SELEUCUS IV.** (187–175), surnamed **PHILOPATOR**, was eager to dispossess the king of Pergamus of the provinces which he had taken from the Syrian monarchy, but fear of the Romans prevented him from carrying out his design.—**ANTIOCHUS IV.** (q.v.), **EPIPHANES** (I.) ("the illustrious"), conquered Coele-Syria and Palestine from the Egyptians, to whom they had been given by his father, but retired from Egypt at the bidding of the Romans. He practiced the most atrocious cruelties on the Jews, whose religion he endeavored to root out, and introduce the Greek religion; but the heroic resistance of the Maccabees (q.v.) completely foiled his project. He died

in a state of raving madness, which was attributed to his sacrilegious crimes by his subjects, who, in derision, converted his surname into *EPIMANES* ("the madman").—The succeeding names of the dynasty were *ANTIOCHUS V.*, *EUPATOR* (164-162); *DEMETRIUS I.*, *SOTER* (162-150), who regained Babylon, lost Judea, and was defeated and slain by the impostor *Alexander Balas* (150-146); *DEMETRIUS II.*, *Nicator* (146-138, 128-125), who overthrew the impostor, and was himself taken prisoner by the Parthians, Syria having been already seized by *Diodotus*, surnamed *Tryphon*, who set up the puppet *ANTIOCHUS VI.*, *Theos* (144-142), and afterward ascended the throne himself (142-137); *ANTIOCHUS VII.*, *Sidetes* (137-128), who restored the royal line of the *Seleucids*; *ANTIOCHUS VIII.*, *Grypus* (125-96), who was compelled to share his dominions with his half-brother, *ANTIOCHUS IX.*, *Cyzicenus* (111-95); *SELEUCUS V.* or *VI.*, *Epiphanes* (96-94), and *ANTIOCHUS X.*, *Eusebes* (95-83), who continued the division till 94 B.C., when the latter was victorious in a pitched battle and seized the whole kingdom; for which, however, he was forced to fight with *Philip*, and *ANTIOCHUS XI.*, *Epiphanes* (II.), the younger brother of *Seleucus*; and *DEMETRIUS III.*, *Eucærus* (94-88), a third brother of *Seleucus*, who, with *Philip*, next claimed the sovereignty, which was taken from them by *Tigranes* (83-69), king of *Armenia*, at the solicitation of the *Syrians*; *ANTIOCHUS XII.*, *Dionysus*, a fourth brother of *Seleucus*, and *ANTIOCHUS XIII.* (69-65), *Asiaticus*. The short-lived prosperity of this dynasty, for it had begun to decline during the reign of *SELEUCUS II.*, 80 years after its foundation, is principally owing to the fatal principle on which it was founded—viz., that of establishing a Græco-Macedonian power in a foreign country, instead of conciliating the attachment of the native populations, and governing them more in accordance with the eastern method; the consequences were the successive revolts of the natives, the foundation of the independent and hostile kingdoms of *Bactria*, *Parthia*, *Armenia*, *Judea*, and the ultimate conversion of the small remnant into a Roman province by *Cneius Pompeius*, 65 B.C.

SELF-DEFENSE, in law, defense of one's person or property from injury. A person upon whom violence is inflicted may defend himself by so much counter-violence as is necessary for his protection and no more. If assaulted by blows, he may defend himself by blows. A man may defend himself, even to the extent of committing homicide, to prevent any violent crime, whose perpetration would constitute a felony. He may return force with force in defense of his person or property against an attempt at forcible felony; and he need not retreat, but may even follow his assailant. Where there is no threatened or intended felony, a man may defend himself in a mutual fight caused by a sudden quarrel, or where without a mutual fight the assailant attempts or commits an assault and battery; and the assailed person, where an attempt to strike him is made and his assailant is near enough to be able to strike him, need not wait to be struck first.

SELF-DENYING ORDINANCE, a measure carried through parliament in 1645 by the influence of Cromwell and the Independents, with the view of removing Essex and the Presbyterians from the command of the army. It was moved by a fanatic of the name of *Zouch Tate*, who on the ground that "there is but one way of ending so many evils, which is, that every one of us freely renounce himself," proposed, that "no member of either house shall, during this war, enjoy or execute any office or command, civil or military, and that an ordinance be brought in accordingly." The ordinance, which was clearly intended to take the executive power out of the hands of the more moderate politicians, and form an army independent of parliament, was the subject of violent and protracted debate, but eventually passed in both houses, and became law. The consequence was that Essex, Warwick, Manchester, and others gave in their resignation, and the conduct of the war was intrusted to *Fairfax*; Cromwell, to whom, as a member of the lower house, the self-denying ordinance extended, as much as to Essex and the rest, had the duration of his commission prolonged by the commons on account of his invaluable services as a leader of cavalry, and by his brilliant achievements soon surpassed his commander in reputation.

SELIM I., Sultan of Turkey, son of *Bajazet II.*, was b. in 1467, dethroned his father by the aid of the *Janizaries*, April 25, 1512, and ascended the throne. To secure himself in his elevation, he caused his father, brothers, and nephews to be put to death, thus beginning a policy which he pursued inflexibly through the whole of his subsequent career, viz., to destroy without scruple every actual or possible obstacle to the accomplishment of his own ends. Urged on by a devouring appetite for conquest, and by the warlike fanaticism of the *Janizaries*, he declared war (1514) against *shah Ismail* of Persia, and marched eastward with an army of 250,000 men, massacring on the way 40,000 Shiites. He encountered *Ismail* at *Calderoon*, and defeated him with immense loss; but a spirit of disaffection breaking out in his army, he was compelled to content himself with this success, which gave him possession of *Diarbekir* and *Kurdistan*. In the following year, he overran *Armenia*; and leaving his lieutenants to complete this conquest, he marched against the *Mameluke* sultan of Egypt, whom he had previously endeavored to detach from intimate alliance with the Persian monarch. *Kansu-ghori*, the Egyptian sultan, was totally defeated (1516) at *Marjabik* by *Selim*, and Syria became the prize of the victor; and *Kansu's* successor, *Touman-Bey*, was still more unfortunate, his army being almost extirpated (1517) at the battles of *Gaza* and *Rudania*. The victorious Turks then entered *Cairo* without opposition; *Touman-Bey* and his chief sup-

porters were put to death, and Egypt incorporated with the Ottoman empire. The last lineal descendant of the Abbaside caliph, who was then resident in Egypt, transmitted to Selim the religious prestige which had devolved upon himself by descent, and at the same time bestowed upon him the title of "Imaum," and the standard of the prophet. In consequence of this gift, the Ottoman sultan became the chief of Islam, as the representative of Mohammed; and the sacred cities of Mecca and Medina, along with the chief Arabian tribes, in consequence acknowledged his supremacy. Thus, in less than four years, Selim did more to extend the Ottoman empire than any of his most renowned predecessors during a whole reign. He also laid the foundation of a regular marine, constructed the arsenal of Pera, chastised the insolence of the Janizaries with savage severity, and labored to ameliorate, by improved institutions, the condition of the various peoples he had conquered. He died Sept. 22, 1521, while planning fresh campaigns against both Persians and Christians. This prince, who in a sense merited his title of *Yavuz* (the ferocious), was nevertheless a lover and encourager of literature, and even himself cultivated the poetic art. Selim was succeeded by his son, Solymán the magnificent (q.v.).

SELIM III., Sultan of Turkey, the only son of Mustapha III., was b. Dec. 14, 1761, and ascended the throne on the death of his uncle, Abdul-Hamid, in 1789. Seeing clearly the causes of the decadence of the empire, and the proper remedies, he inaugurated a policy of renovation and progression; but the war with Russia, in which his newly raised army of 150,000 men was totally defeated, first by the prince of Coburg, and next by Suwarof, put a stop for a time to his schemes of reform. He was compelled, in 1791, to cede Choczim to Austria, and in the following year, all his possessions beyond the Dniester to Russia. About this time, his good harmony with Napoleon was troubled by the expedition of the French to Egypt, and subsequently by the question of the recognition of the French empire, but on the whole, Selim continued the faithful ally of France; and at every opportunity pursued with ardor his various reforms, establishing cannon-foundries, and organizing a body of troops ("the Nizam-Djedit"), armed, clothed, and disciplined in the European fashion; but this last reform stirred up against him (1805) all the fanatic bigotry of his subjects. The priests of Islam even preached revolt in different parts of the empire, and accused their sovereign of despising the holy injunctions of the Koran, so that Selim felt compelled to adopt a more cautious policy. At length, a formidable rebellion broke out, and the Nizam-Djedit, who attempted to suppress it, were overpowered, their commander put to death, and the rebels marched into Constantinople, their ranks being swelled at every step by bodies of disaffected Janizaries. All those who had favored or forwarded the sultan's schemes were seized and put to death, and Selim was compelled to issue a decree suppressing the new institutions. But the malignant enmity of the mufti and his coadjutors was not thus to be satisfied, and Selim saw himself forced to resign the throne (1807) to his cousin, *Mustapha IV.* (1807-8).

On the news of this insurrection being conveyed to Mustapha-Bairaktar, the pasha of Rustchuk, and one of the sultan's chief advisers, this energetic and able soldier marched upon Constantinople, with a view to reinstate Selim on the throne, but on his arrival the unfortunate monarch was strangled, and his body cast at the feet of Bairaktar. See **BAIRAKTAR**. Thus perished Selim, and with him the first attempt at reformation in Turkey; the effects of which, however, were not wholly lost, for manufactures had begun to flourish, thousands of silk and other looms were now in vigorous operation, a printing press had been established in Scutari, and many other improvements calculated to foster the prosperity and happiness of his subjects, had been inaugurated; though these advantages, the natural result of Selim's enlightened patriotism, were neither understood nor appreciated by the great majority of his ignorant and fanatical subjects.

SELIM'NO, a manufacturing t. of European Turkey, in eastern Roumelia, at the southern base of the Balkan mountains, 65 m. n. of Adrianople. Owing to its far inland position, there is little communication between the town and the coast, and consequently the annual fair held here is of very great importance. Pop. 20,000.

SELINUS, an ancient Greek colony in s.w. Sicily, at the mouth of the Selinus river; founded in the 7th c. B.C.; destroyed by the Carthaginians in 409. It was rebuilt, but never regained its former prosperity. Among its ruins are many portions of ancient temples.

SELJUKS, or **SELJUK-TURKS**, were an offshoot of the Hoi-Hu or Hoi-Hu, a collection of tribes of Turkish race, who, being driven south-westward from the Chinese wall, had, in 744, A.D., overwhelmed that Turkish empire of Kiptchak which had given so much annoyance to the Sassanidæ (q.v.) during their reign in Persia. The Hoi-Hu rapidly extended their power from the Caspian sea as far as the Hoang-ho, and, at the time when the Seljuks separated themselves from them, were ruled by a chief named Bigü Khan. Seljuk, from whom the Seljuks derived their name, was the chief of a small tribe which had gained possession of Bokhara and the surrounding country. His sons, attracted by the beauty and fertility of Khorassan, began about 1027, to migrate to that country, and after some struggles with the Ghiznevide sultans, established them-

selves in northern Khorassan, with TOGRUL BEG, the eldest grandson of Seljuk, as their chief, and Nishapur as their capital. Togrul, leaving his brother in Khorassan, set out on his conquering march, subdued Balkh and Khaurezm in 1041, Irak-Ajemi in 1043, subsequently adding to these Kerman and Fars. He then advanced to Bagdad, which he took in 1055, dethroning the last vizier of the Dilemite (see SAMANI) dynasty, and being invested by the reigning caliph with the vacant office; after which he completed his conquest of Persia by the reduction of Irak-Arabi and Mosul about 1061. The Seljuks were zealous Mohammedans, and Togrul Beg seems to have been a vigorous promoter of the faith which he professed, for he built numerous mosques, subsidized pious and learned men, and treated the caliph—his spiritual chief—with profound respect. After his death in 1063, his nephew Alp-Arslan (q.v.) succeeded to supreme power, and became one of the most renowned monarchs of Asia. His son MELEK SHAH (1073-93), the most powerful monarch of this dynasty, added, by means of his generals, Arabia, Asia Minor, Armenia, Syria and Palestine, and Transoxiana to his empire, which now extended from the Hellespont to the borders of Chinese Tartary; and even the ruler of Cashgar acknowledged his authority. This empire, though extensive and ill-compacted, was preserved in the highest order and prosperity by his able minister, the virtuous Nizam-ul-Mulk, under whose, firm, just, and wise government the rights of all classes were maintained, religion promoted, and learning encouraged, till the Persians who had dreaded the conquest of their country by the Turks as the worst of evils, were forced to confess that it had proved the greatest of blessings. In 1092 Melek Shah, lending an ear to the misrepresentations of Nizam-ul-Mulk's enemies, deprived him of his office; and the aged minister was soon afterward assassinated by one of the followers of Hussun Subah, the chief of the assassins (q.v.), and the mortal enemy of the good ex-vizier. Hospitals, caravansaries, bridges, roads, and canals attest the zeal with which the commercial interests of the empire were furthered; while the colleges of Bassora, Ispahan, and Herat, the law-college of Bagdad, and the observatory (the first in Asia) of the same city indicate the care bestowed on the promotion of literature and science. Melek Shah, under whom the empire of the Seljuks had attained the height of its power and splendor, laid a sure foundation for its rapid decline by subdividing it into a number of separate principalities, all professedly subject to the central state of Iran or Bagdad. The chief of these principalities were: 1. The central state of *the Seljuks of Iran*, whose ruler was the vizier of the caliph, and exercised direct authority over northern and western Persia to the borders of the Arabian desert. The chief monarchs of this branch were Mohammed Shah, whose generals warred with the crusaders in Palestine, and sultan Sanjar, one of the most celebrated of the Seljuk princes, great both in success and misfortune. This branch was annihilated in 1194 by the shah of Khaurezm. 2. *The Seljuks of Kerman*, who were annihilated in 1191 by the Ghuz Turkomans. 3. *The Seljuks of Iconium*, who ruled over Asia Minor, and whose founder was Soliman, a great-grandson of Seljuk. This branch endured for 224 years—from 1075 to 1299—and during that period was engaged in numerous wars with the Byzantines and with the crusaders, both of whom learned to dread its power. During its last years it was tributary to the Mongols; and in 1299 the present Turkish empire rose on the ruins of its power (see OTHMAN). 4. *The Seljuks of Aleppo*, who ruled from 1079 till their extinction in 1114. 5. *The Seljuks of Mosul*, who were speedily supplanted by *attabegs*, or independent governors, of whom Zenghi, and his renowned son, Nouredin (q.v.), were the most celebrated. 6. *The Seljuks of Damascus*, an offshoot (1096) from the Aleppo principality, which lasted till 1155, when it was put an end to by Nouredin. 7. *The Seljuks of Mardin*, who only appear in common history as the allies of the Seljuks of Iconium, Mosul, Aleppo, and Damascus, against the mighty crusading armies of western Europe. And 8. *The Seljuks of Khaurezm (Khiva)*, who founded a great empire, including the whole of the country within the Jaxartes, the Bolor mountains, the Indus, the sea of Oman, and the Persian gulf; but the last monarch, Allah-ed-din Mohammed Shah, having wantonly put to death some Mongol merchants who were pursuing their avocations within his dominions, was doomed to destruction by the terrible Genghis Khan (q.v.), who crossed the Sir-Daria, conquered Transoxiana, defeated Mohammed's armies, and drove the shah himself to take refuge in an island of the Caspian, where he died. The advance of the Mongols was gallantly opposed by Mohammed's celebrated son, Jelal-ed-din, who twice defeated them; but being totally routed (1221) on the w. bank of the Indus, by Genghis himself, he plunged his horse into the Indus, and safely reached the opposite bank, none of his enemies daring to follow him. The whole of this extensive empire now fell under Mongol domination.

SELKIRK, ALEXANDER. See JUAN FERNANDEZ.

SELKIRK, a parliamentary and royal borough, parish and market town, capital of the county of Selkirkshire, Scotland, on an eminence overlooking the famous field of Philpaulgh, where gen. David Leslie defeated Montrose and crushed the cause of king Charles in Scotland, 30 m. s.s.e. of Edinburgh. The county buildings (opened 1870), the old town-hall, with a spire 110 ft. high, and the monuments to sir Walter Scott and to Mungo Park are the principal architectural features. Selkirk has large woolen-mills. Tweeds, hosiery, and blankets are the chief articles of manufacture. Pop. '91, 3397. Selkirk joins with Hawick and Galashiels in sending one member to parliament.

Selkirk commands a splendid view across the valley or haugh in which the Ettrick and Yarrow meet. It is within a few miles of many of the most famous localities in Scotland, and is a favorite starting-point for tourists desirous of exploring the "Scott" country, the "forest," the Yarrow, and St. Mary's loch. Upward of a hundred fighting men went from Selkirk to join king James in his fatal march to Flodden; of these, only four returned, but they proudly bore a standard taken from the enemy on that occasion. The manufacture of "single-soled shoon" long flourished here, and the "Souters of Selkirk" are commemorated in song and story.

SELKIRKSHIRE, in ancient times called Ettrick Forest, is bounded by the counties of Midlothian, Roxburgh, Dumfries, and Peebles, on the n., e., s., and w. respectively. It extends in length from n. to s. about 28 m., and from e. to w. 16 to 18 m., and consists mainly of the two parallel valleys through which flow the rivers Ettrick and Yarrow. Its area is 257 sq. m. It is in a great measure a pastoral county, and some of the hills are of considerable altitude, the highest of which is Dun Rig (2433 ft.). The hills are rounded at the top instead of peaked, and are covered generally with grass, affording excellent pasturage, but in some places with heather. The arable land, situated from nearly 300 to 800 ft. above sea-level, and bearing the proportion of about one-seventh of the area, is, in general, of a light soil, and produces the ordinary crops in abundance. Besides the Ettrick and Yarrow, the Tweed, Gala, and Caddon flow through parts of the county. The banks of several of these are beautifully wooded; but the extensive woods from which the county originally took its name of the Forest, have disappeared. The county of Selkirkshire contains some very interesting historical scenes, among which is the field of Philiphaugh, where the marquis of Montrose was defeated by the Covenanters under gen. Leslie. Oakwood Castle, in ruins, was the residence of the famous wizard, Michael Scott; and Newark, also in ruins, was the residence of Anne, duchess of Buccleuch, where the *Lay of the Last Minstrel* is represented by Scott as having been sung. Selkirkshire is pretty well appointed for roads. The Hawick line of the North British railway runs for a short distance along its border, from which, at Galashiels, there is a branch to Selkirk; and the North British line from Edinburgh to Peebles passes through its northern end from Innerleithen to Galashiels, a distance of about 12 miles. Selkirkshire and Peeblesshire conjoined return one member to parliament. Pop. '81, 25,564; '91, 27,712.

SELLA, QUINTINO, 1827-84; b. and d. Biella, Italy: was educated at the univ. of Turin, and at the school of Mines, Paris. He was for a time prof. in the Turin mining academy. He held the position of minister of finance three times between the years 1862 and 1873. As a scientist, his reputation was not inferior to his reputation as a statesman.

SELLAR, WILLIAM YOUNG, LL.D., was born in Sutherlandshire in 1825, and was educated at Glasgow University and Balliol College, Oxford. In 1851 he was assistant to the Professor of Humanity in Glasgow, and in 1855 went to St. Andrew's as assistant to the professor of Greek, whom he succeeded six years later. In 1863, he was made professor of Humanity in the University of Edinburgh. Professor Sellar has written *Roman Poets of the Republic* (1863, 2 ed., 1889), *Roman Poets of the Augustan Age* (1877), and also contributed articles on Latin Literature, and essays on various subjects to the periodicals. He died in 1889.

SELMA, city and co. seat of Dallas co., Ala.; on the Alabama river and the Birmingham, Selma, and New Orleans, the Louisville and Nashville, the Mobile and Birmingham, the Southern, and the Western of Alabama railroads; 50 miles w. of Montgomery. During the civil war it was one of the most important interior places in the confederacy, having an arsenal, gun-foundry, and extensive powder works, and was held by the confederates till within a few days of gen. Lee's surrender. It contains Selma university (Bapt.), Dallas academy, Burrell school for colored pupils, Y. M. C. A., national and state banks, electric lights, and extensive cotton factories, iron works, railroad machine and car wheel plants, planing mill, cotton-seed oil mill, ice-factory, and other industries. It has regular steamboat communication with Mobile, and large trade in cotton, lumber, coal, and iron. Pop. '90, 7622.

SELTERS WATER (commonly but incorrectly written *seltzer water*), takes its name from the village of Lower Selters near Limburg, in the duchy of Nassau, where several springs united, in one basin, yield 5,000 cubic ft. an hour of this sparkling and effervescing mineral water. Its chief ingredients are carbonic acid, carbonate of soda, and common salt. It acts as a mild stimulant of the mucous membranes and as a diuretic; and is applied in chronic disorders of the digestive, respiratory, and urinary organs. It is much recommended as a beverage, either alone or with sugar, to those suffering from liver complaint, and in hot climates and seasons. More than 1½ millions of jars or bottles of this famous water are exported yearly to all quarters of the world, affording to the state a revenue of above £6,000. The spring was discovered early in the 16th c., but was at first so little prized, that in the middle of the 18th c. it was rented for 4s. The water is little drunk at the spring. Artificial selters water is extensively manufactured both on a large scale and for domestic use. See **AERATED WATERS**.

SELWYN, GEORGE AUGUSTUS, D.D.; b. England, 1809; educated at St. John's college, Cambridge; tutor at Eton, and for a while rector at Windsor; consecrated in 1841 bishop of New Zealand, where he labored for many years. In 1867 he was appointed bishop of Lichfield. In 1874 he visited the United States and Canada. His published works are: *Are Cathedral Institutions Useless? Sermons*; *Tribal Analysis of the Bible*; *The Work of Christ in the World*. His brother William, 1806-75, was professor of divinity at Cambridge in 1855, and one of the English revisers of the authorized version of the Old Testament. Bp. Selwyn d. 1878.

SELWYN COLLEGE. See CAMBRIDGE, UNIVERSITY OF.

SEMAPHORE (from *sēma*, a sign, and *phērō*, I bear) was the name applied to the system of telegraphy in use before the application of the electric current. Semaphores were first established by the French in 1794, as a plan for conveying intelligence from the capital to the armies on the frontier. In the following year, lord George Murray introduced them in England; and by their means the board of admiralty were placed within a few minutes of Deal, Portsmouth, or Plymouth. These semaphores consisted of towers built at intervals of from 5 to 10 m., on commanding sites. On the top of each tower was the telegraph apparatus, which at first comprised 6 shutters arranged in 2 frames, by the opening and shutting of which, in various combinations, 63 distinct signals could be formed. In 1816 sir Home Popham substituted a mast with 2 arms, similar to many of the present railway signals. The arms were worked from within the tower by winches in the look-out room, where a powerful telescope in either direction constantly commanded the mast of the next station. If a fog set in at any point on the route, the message was delayed; otherwise, when a sharp look-out was kept, the transmission was very rapid. For instance, the hour of one by Greenwich time was always communicated to Portsmouth when the ball fell at Greenwich; the semaphores were ready for the message, and it commonly passed from London to Portsmouth and the acknowledgment back to London within three-quarters of a minute. Each station was in the charge of a naval officer—usually a lieutenant—with one or two men under him. To save the cost of this establishment, the Deal and Plymouth lines fell into disuse soon after the peace of 1815; and the superior advantages of the electric telegraph being incontestable, the Portsmouth line sent its last message Dec. 31, 1847, and, on land at least, the semaphore closed its career of usefulness for ever. In calm weather, when flags will not extend, semaphores are employed on board ship as a means of signaling from vessel to vessel, or to the shore; in such a case, the post containing the arms is movable, and can be readily shipped or unshipped near the stern. See also SIGNALS.

SEMBRICH, MARCELLA (real name, PAXEDE MARZELLINE KOCHANSKA), vocalist, was born at Lemberg, Austria, February 18, 1858, and for some years studied the piano and violin. While taking piano lessons from Liszt at Vienna, her splendid voice was discovered, and she was at once sent to Milan to study singing. She made her *début* in opera at Athens in *I Puritani*, in 1877, appeared at Dresden in 1879, and remained at the Royal opera house till 1880. She soon became a great favorite in the characters of *Zerlina*, *Susanna*, *Constance*, *Mariha*, and *Lucia*. In 1880 she made her first appearance in London. Mlle. Sembrich has sung in all the principal cities of Europe, and has been received everywhere with the greatest enthusiasm. In 1883-4 she was a member of Mr. Abbey's Italian Opera Company at New York, where she created a great sensation. She signed an engagement in 1885 with the Theatre of Barcelona, and continued her foreign tours until 1889, when she returned to Paris. She reappeared in New York in 1897.

SE MÉ, in heraldry. When a charge is repeated an indefinite number of times so as to produce the appearance of a pattern, the term *semé* (sometimes *aspersed* or *powdered*) is applied to it. When a field is *semé*, it is treated as if it were cut out of a larger extent of surface, some of the charges being divided by the outline of the shield.


SEMECARPUS, a genus of trees of the natural order *anacardiaceæ*. The MARKING NUT of India is *S. anacardium*, a tree 50 ft. high, growing on mountains. The swollen receptacle of the flower becomes a succulent fruit, eatable when roasted, but astringent and acrid when raw. On the receptacle is seated the nut, which is heart-shaped and black, consisting of a kernel—not unwholesome, although rarely eaten—surrounded by two skins, between which is a black acrid juice. This juice is used in medicine as an external application to heal rheumatism, etc. It is also in general use in India for marking cotton cloth; and the color is improved, and running prevented, by the addition of a little quicklime and water. The wood of the tree contains so much acrid juice that it is dangerous to work upon.


SE MELE. See BACCHUS.

SE MENCINE, SEMEN CINÆ, and SEMEN CONTRA. See ARTEMISIA.

SEMENDRIA, a t. of Servia (q.v.), capital of province of Podunavlje, stands amid romantic scenery on the right bank of the Danube, 25 m. s.e. of Belgrade. The inhabitants, who numbered in 1890, 6726, are employed principally in wine culture, in breeding hogs, and in general trade. It was at one time the seat of the Servian kings; and it has been frequently stormed by the nations who have contended for the Danube from the middle ages to the present century.

SEMESTER, literally a period of six months. A name given in Germany to each of the two terms into which the university year is divided: the summer semester and the winter semester. The name is sometimes used in this country also, as at Vassar college.

SEMIBREVE, in music, a note of half the duration of the breve of old ecclesiastical music, but the longest note in use in modern music. It is represented by a character circular or elliptical in form  and is adopted as the integer or measure-note, the other notes—minim, crotchet, quaver, etc.—being proportional parts of it.


SEMI-DEMI-SEMIQUAVER, a musical note, of which 8 are equivalent to a quaver, 32 to a minim, and 64 to a semibreve. It is represented thus,  or in groups

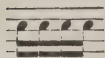
thus, 

SEMINOLES, a tribe of American Indians, originally a vagrant branch of the Creeks, whose name, Seminole, signifies wild or reckless. In 1705 they aided in driving the Appalaches from Florida; and in 1817 they joined with the Creeks and some negroes who had taken refuge with them, ravaged the white settlements in Georgia, plundering plantations, and carrying off slaves, whom they refused to surrender. Gen. Jackson, sent to punish them, took at the same time several Spanish forts, and hastened the negotiations which ended in the cession of Florida to the United States. At this cession in 1823, the Seminoles engaged to retire into the interior, and not molest the settlers; but as the negroes continued to take refuge with them, a treaty was made with some of the chiefs, in 1832, for the removal of the whole tribe west of the Mississippi. This treaty was repudiated by the tribe, at the instigation of Osceola (q. v.), one of their chiefs; and a war commenced against a handful of savages, which lasted eight years, and cost thousands of lives, and ten millions of dollars. In the end, the majority of the tribe were removed to the Indian territory on the borders of Arkansas.

SEMPALATINSK', a province of Russian Central Asia, is bounded on the e. and s. by Tomsk, the Chinese empire, and Turkestan. Area, 184,631 sq. m.; pop. '90, 581,581. It is separated from Turkestan on the south by the Alexandrian mountains, in lat. 42° 30' n., and it is traversed by several other mountain chains. The chief rivers are the Irtysh, Ili, and Chui; and among the lakes are those of Issik-Kul, Ala-Kul, and Balkash. Sempalatinsk (pop. '92, 28,960) is the capital.

SEMI-PELAGIANISM, a modification, as the name implies, of the doctrine of the Pelagians as to the powers of the human will, and as to the effects to be attributed to the action of the supernatural grace of God, and of the divine decree for the predestination of the elect. The Pelagians, discarding altogether the doctrine of the fall of Adam, and the idea that the powers of the human will had been weakened through original sin, taught that man, without any supernatural gift from God, is able, by his own natural powers, to fulfill the entire law, and to do every act which is necessary for the attainment of eternal life. The condemnation of this doctrine by the several councils held in the early part of the 5th c. is capable of various constructions, and has been urged by some to the extreme of denying altogether the liberty of man, and converting the human will into a merely passive instrument, whether of divine grace upon the one hand, or of sinful concupiscence upon the other. The writings of St. Augustine on this controversy have been differently construed by different Christian communions (see PELAGIANISM); and the same diversity of opinion existed in his own day. Among those who, dissenting from the extreme view of Pelagius, at the same time did not go to the full length of the Augustinian writings in opposition to Pelagius, were some monks of the southern provinces of Gaul, and especially of Marseilles, whence their school was called Massilian, from the Latin name (*Massilia*) of that city. Of these leaders, the chief was a priest named Cassian, who had been a deacon at Constantinople. Of the system which he propounded, without going into the details, although many of them are exceedingly curious and interesting, it will be enough to say that it upheld the sufficiency of man's natural powers only so far as regards the first act of conversion to God and the initial act of man's repentance for sin. Every man naturally possesses the capability of beginning the work of self-conversion; but for all ulterior acts, as well as for the completion of justification, the assistance of God's grace is indispensable. The Semi-Pelagian doctrine is often confounded with that of the Molinistic (see MOLINA) school of Roman Catholic theology; but there is one essential difference, viz., that the latter persistently maintain the necessity of grace for all supernatural acts, even for the beginning of conversion, although they are generally represented as agreeing with the Semi-Pelagians as to the mode of explaining the freedom of the human will acting under the influence of divine grace. The chief writers in the controversy were Prosper, Hilary, and Fulgentius; and the question was referred to Celestine, bishop of Rome in 431. It continued, however, to be agitated in the west for a considerable time. Faustus, bishop of Riez, toward the end of the 5th c., revived the error, and it was condemned in a council held at Arles in 475, and still later in a synod (the second) held at Orange (Arausio) in 525, and again in the third council of Valence in 530.

SEMIQUAVER, a musical note, represented thus,  or in groups thus,



equivalent in value to $\frac{1}{2}$ of a quaver, $\frac{1}{4}$ of a crotchet, $\frac{1}{8}$ of a minim, or $\frac{1}{16}$ of

a semibreve. The *Practica Musica* of Gafurius (Milan, 1496) contains the earliest mention of the semiquaver. This note occurs rarely in the printed polyphonic music of the 16th century in the form of a black lozenge-headed note.

SEMI-QUIETISM, a form of mystical asceticism which, while it adopts the theoretical principle that the most perfect state of the soul is that of passive contemplation, and denies, in certain conditions of the soul, the necessity of prayer or other active manifestations of virtue, yet maintains the incompatibility of this passive contemplation with any external sinful or sensual action. The Semi-Quietists thus differed from the grosser sectaries referred to under **QUIETISTS**.

SEMI-AMIS. See **ASSYRIA**.

SEMITIC. See **SHEMITIC**.

SEMITONE, in music. The name given to the smaller intervals in the diatonic scale, as E F or B C, in which the ratio is as 15 to 16.—In the pianoforte, the interval between any two notes between which no other note is interposed, as C to C# or B \flat to B, is a semitone.

SEMLER, JOHANN SALOMO, one of the most influential German theologians of the 18th c., was born Dec. 18, 1725, at Saalfeld, where his father was archdeacon; educated at Halle, and in 1749 went to Coburg as professor at the gymnasium. In 1751 he was appointed a professor of theology at Halle, where he taught with great success; and six years later, became director of the theological seminary there. He died Mar. 14, 1791. Semler was, in the early part of his student-career, somewhat of a Pietist, but the predilections of Sigm. Jak. Baumgarten may be said to have revolutionized his religious convictions, and swung him round to rationalism, of which he was the first systematic exponent. Semler's rationalism, however, was always moderate in degree, though definite enough in kind. As a thinker, he was deficient in philosophical consistency and breadth of view; and as a writer he possessed no literary skill or grace; but his works are valuable for the spirit of historical criticism by which they are pervaded. The principal are: *Apparatus ad liberalem Veteris Testamenti Interpretationem* (Halle, 1773), *Abhandlung von der Untersuchung des Kanons* (4 vols., Halle, 1771-75), *De Dæmoniis* (Halle, 1760), *Umständliche Untersuchung der Dæmonischen Laute* (Halle, 1762), *Versuch einer Biblischen Dæmonologie* (Halle, 1776), *Selecta Capita Historiæ Ecclesiasticæ* (3 vols., Halle, 1767-69), *Commentationes Historiæ de Antiquo Christianorum Statu* (2 vols., Halle 1771-72), *Versuch Christlicher Jahrbücher oder ausführliche Tabellen über die Kirchengeschichte bis aufs Jahr. 1500* (2 vols., Halle, 1783-86), *Observationes novæ, quibus Historia Christianorum usque ad Constantinum Magnum illustratur* (Halle, 1784).—See his *Lebenstage* (Halle, 1791), H. Schmid, *Die Theologie Semler's* (1858), and Tholuck in his *Vermischte Schriften*.

SEMLIN, a city in Croatia-Slavonia, Austria-Hungary, stands on a tongue of land at the junction of the Save and Danube, on the right bank of the latter, opposite Belgrade. Within recent years the town has been much improved, though even yet a suburb consisting of mud huts thatched with reeds stretches along the Danube. The only noteworthy edifices are the churches, the German theater, and the lazaretto (*Contumaz*), the chief quarantine station in the whole of the military frontier. At this institution, travelers crossing from Turkey are compelled to remain a greater or less time—sometimes 40 days—in proportion to the violence and proximity of the plague. The reason why the principal lazaretto is here is that Semlin is the great seat of the Turco-Austrian transit-trade, and the principal ferry for passengers from Christendom to the land of the Moslem. Pop. '90, 12,823.—For a graphic notice of Semlin, see Kinglake's *Eothen*.

SEMMERING, a mountain on the borders of Styria and Austria, and 44 English m. s.w. by w. from Vienna, is 4,416 ft. above the level of the sea. The Vienna, Grätz, and Trieste Railway has been carried across this mountain by a series of ingenious engineering contrivances. See **GLOGGNITZ**.

SEMMES, RAPHAEL, American naval officer, was b. in Maryland, Sept. 27, 1809; in 1830 entered as midshipman in the sloop of war *Lexington*, and was employed in the service as passed midshipman and lieutenant until 1855, when he attained the rank of commander. In 1858 he was appointed secretary to the lighthouse board, but resigned Mar. 26, 1861, joined the naval service of the confederate states, and was appointed to the command of the war steamer *Sumter*. The career of Captain Semmes until the sinking of his famous ship, the *Alabama*, by the American war steamer *Kearsarge*, is described at length in the article **ALABAMA**. He returned to America, and was elected judge of probate at Mobile, Alabama; but being prohibited by the federal authorities, he was, in 1866, appointed professor of moral philosophy in a southern university. He published *Service Afloat and Ashore During the Mexican War* (1851), *Campaign of General Scott in the Valley of Mexico* (1852), the *Cruise of the Alabama* (1864), *Memoir of Service Afloat During the War between the States* (1869). He d. 1877.

SEMNOPITHECUS, a genus of monkeys, natives of the east, having a very long, slender, powerfully muscular, although not prehensile tail. The canine teeth are long, but the molar teeth are more tuberculous than in the gibbon (q.v.) and other allied monkeys, indicating a greater aptitude for vegetable food. With this the structure of the stomach corresponds, which is very remarkable, and different from that of all other animals; consisting of a cardiac pouch, slightly bifid at the extremity; a very wide middle portion, formed of numerous pouches or sacs; and a very long canal, furnished with sacs at its commencement, but simple toward its termination. Professor Owen has been careful, however, to point out that these three portions do not correspond to any of the parts of the stomach of a ruminant animal, not exhibiting any such diversities in their internal surface. The species are numerous. The entellus (q.v.) monkey is one of them. Another is the negro monkey (*S. maurus*) of Java, remarkable for its jet-black color and long silky hair.

SEMOLINA (Semola or Semoule), an article of food much used in France and Italy, and to a small extent in Britain, and other countries. It consists of particles of wheat varying in size from grains of sand to small millet. Only the hard-grained wheats of Spain, Odessa, and southern Italy are adapted for making it; these hard wheats are not easily reduced to flour, and small particles escape being crushed by the mill-stones, and will not pass through the sieves—these constitute semolina. In France more attention is paid to this article than in any other country; and as it fetches a higher price than flour, the skillful miller so adjusts his mill-stones as to produce a considerable quantity. The granules of semolina are of various sizes, and they are carefully separated by sieves, the openings of which are from fine to coarse. A favorite kind of bread made of the coarser kinds of semolina (the semoule of the French) is sold in Paris under the name of *gruau*. In Italy it is used in making polenta, in common with maize, meal, and millet; and in Britain it is used for puddings.

SEMPACH, a small t. of Switzerland, in the canton of Lucerne, and 8 m. by railway n.w. of the town of that name, stands on the e. shore of the lake of Sempach. It is surrounded with walls, now in a ruinous condition, has a population of a little over 1000, and was one of the outposts of the confederate cantons against their Suabian and Austrian assailants in the 14th century. Under the walls of Sempach took place the second great conflict of the confederated Swiss cantons with Austria. Leopold's army of 4,000 horse and 1400 foot arrived before Sempach on July 9, 1386, and found itself unexpectedly opposed by the confederated Swiss to the number of 1300. The nature of the ground being unfitted for the action of cavalry, the knights dismounted, and formed themselves into a solid and compact body, which was at once charged by the Lucerners; but the wall of steel was impenetrable, and not a man of the Austrians was even wounded, while 60 of the bravest of Lucerne, with their landaman, fell. The mountaineers were beginning to despair of making an impression on their apparently invulnerable opponents, when Arnold von Winkelried, a knight of Unterwalden, seized with a noble inspiration, rushed forward, grasped with outstretched arms as many pikes as he could reach, buried them in his bosom, and bore them by his weight to the earth. His companions rushed over his body into the breach thus made, slaughtered the armor-encumbered knights like sheep, and threw the remainder into the utmost confusion and dismay. The conflict continued in an irregular manner for some time longer, but the result was a decisive victory for the Swiss, who had lost only 200 men; while the loss of the Austrians was ten times as great, including 600 counts, barons, and knights. The body of duke Leopold, who had throughout displayed the most obstinate valor, was found next day buried among a heap of slain. The anniversary of this great victory is still celebrated by prayer and thanksgiving on the field of battle.

SEMPER, GOTTFRIED, 1803-79; b. Hamburg; studied architecture in Italy and Greece; professor at the academy of art in Dresden, and at the school of architecture 1834-49; became involved in political difficulties and went to London. He taught at the Royal academy for a few years, and in 1853 went to Zurich as teacher in the polytechnic institute. His greatest works are the observatory at Zurich, the festtheater at Munich, the new theaters at Dresden and Darmstadt, and the museum and imperial palace in Vienna. He published *Die vier Elemente der Baukunst* (1851), and *Der Styl in den Technischen und Tektonischen Künsten*, 2 vols. (1860-63).

SEMPERVIVUM. See HOUSE-LEEK.

SEN, KESHUB CHUNDER, Babu, b. 1838, first became known through his connection with a society in Calcutta called the Brahmo Somaj, which he joined in 1857. The Somaj was then under the leadership of Debendra Nath Tagore, and aimed at the abolition of caste and the maintenance of a divine worship. Chunder Sen became the leader of a party of the younger portion of the Somaj, who wished to advance more rapidly than the others were willing to follow. In 1865 he presented to Nath Tagore three propositions, intimating that if rejected a separation would ensue. These were: 1. That the external signs of caste distinction, as the Brahmanical thread, should be no longer used. 2. That none but Brahmas of fair ability and good, moral, pure lives should be allowed to conduct the services of the Somaj. 3. That no word should be uttered in the Somaj in contempt or hatred of other Somajes. The first was rejected as too radical. A division resulted;

Tagore and the minority calling themselves the Adi (original) Somaj, the majority becoming known as the "progressive Somaj," of which Chunder Sen was the acknowledged leader. Later on he delivered a lecture in Calcutta, in which he used the following expressions: "My love of Christ constrains me to speak of him. The Christ who is advancing in all directions has touched India, and hence the question she asks, Who is Christ? Though often defied and persecuted by the world, I have found sweetness and joy unutterable in my master Jesus. I fell at his feet, saying, Blessed child of God, when shall others see the light that is in thee?" He did not accept the organized ecclesiastical Christianity of Europe and America, demanding for India a Christ presented in oriental forms for the Hindu mind. In 1870 he visited England, where he was most cordially received by scholars and eminent ecclesiasts. Envy, perhaps, and undoubtedly dislike for his fondness of external show, and hatred of his despotic character, produced a reaction among his followers, and when, in 1878, Sen, who had been one of the prime movers in the passage of the law against child marriage, permitted his daughter, thirteen years old, to wed the Rajah of Cutch Behar, he was deposed by some of his congregation. Many former adherents withdrew, and formed, May 13, 1878, the Sadhara or Cothetic Brahma-Somaj. In 1881 he celebrated what he called the birth of the New Dispensation. (See BRAHMO-SOMAJ.) He died Jan. 4, 1884.

SENATE. See **ROME**.

SENATE, UNITED STATES, the upper house of congress; composed of twice as many members as there are states in the union, the two members from each state being elected by the respective state legislatures, to hold office for six years. The senators are held to represent the local sovereignty of their respective states. All bills in congress must pass both houses to become laws; though these may originate in either house. Of special functions, the senate possesses that of ratifying treaties with foreign powers; of confirming nominations to office made by the president, and of sitting as a high court of impeachment in case of the trial of public officials. The different states have each an upper house corresponding in its duties and powers with the United States senate. See **UNITED STATES**.

SENATORIAL COURTESY is a term applied to an unwritten rule that has full cognizance in the parliamentary code of the Senate of the United States. When an ex-Senator is nominated for any office, Senatorial courtesy demands that his nomination shall be confirmed at once without reference to any committee. Again, if the two Senators from a state object to an appointment made from their state, the unwritten code requires that the nomination be put aside indefinitely with no further reason than their objections. The privileges of the floor in speaking for so long as a Senator chooses is also said to come under the same rule.

SENATUS ACADEMICUS, one of the governing bodies in the Scottish universities, consisting of the principal and professors. It is charged with the superintendence and regulation of discipline, and the administration of the university property and revenues, which last function, since the universities Scotland act of 1858, the senatus exercises subject to the control and review of the university court. Degrees are conferred by the senatus through the chancellor or vice-chancellor. The principal is president, and, besides his deliberative vote, has a casting vote. In his absence, the senior professor present acts as chairman, who has also a double vote. One-third of the senatus is required to form a quorum.

SENDAI, an important town and military center in Japan in the n.e. of the main island, about 10 m. from the coast. It has many Christian and Greek schools. The town manufactures large quantities of trays, etc., from fossil wood. Pop. '91, 66,310.

SENDOMIR or **SANDOMIR MOUNTAINS**. See **RADOM**.

SENECA, a co. in central New York, having Cayuga lake and Seneca river on the e., Seneca lake, forming two-thirds of its w. boundary, 346 sq. m.; pop. '90, 28,227. It is drained by the Seneca and Clyde rivers. Co. seats, Ovid and Waterloo.

SENECA, a co. in n. Ohio, intersected by the Lake Erie and Western, the Cleveland, Cincinnati, Chicago, and St. Louis, the Pennsylvania Co.'s, and the Baltimore and Ohio railroads. 544 sq. m.; pop. '90, 40,887. It is drained by the Sandusky river, Honey Rock, and Green creeks. Co. seat, Tiffin.

SENECA, M. ANNÆUS, the rhetorician, was born at Corduba (Cordova) in Spain. The time of his birth is doubtful, probably about 61 B. C. He seems to have been in Rome during the early period of the power of Augustus. He was rich, belonged to the equestrian order, and enjoyed the friendship of many distinguished Romans. From Rome he returned to Spain, where he married Helvia, and had by her three sons. The time of his death is uncertain; but he probably lived till the close of the reign of Tiberius, and died in Rome or Italy. His extant works are *Controversiarum Libri X.*, and *Suasoriarum Liber*, neither of which is complete. They are elaborately rhetorical in style, but do little to support the fame of their author, who is more remembered for his prodigious memory than for anything else.

SENECA, L. ANNÆUS, son of M. ANNÆUS, and a celebrated philosopher, was also born at Corduba a few years B. C. When a child, he was brought by his father to Rome, where he was initiated in the study of eloquence. He cared more, however, for phi-

losophy, in which his first teacher was the Pythagorean Sotion, whom he afterward left to follow Attalus the Stoic. He traveled in Greece and Egypt; and, in obedience to his father's wishes, he pleaded in courts of law; but, notwithstanding his forensic triumphs, he left the bar from fear of Caligula's jealousy. On entering into public life, he filled the office of quaestor, and had already risen high in the favor of the emperor Claudius, when he was accused of an adulterous connection with Julia, the daughter of Germanicus, and wife of Vinicius. He was exiled to Corsica, where he remained for eight years, deriving from philosophy what consolation he could, while incessantly complaining with a by no means philosophic querulousness, and appealing to the emperor for pardon. When Claudius married his second wife, Agrippina, Seneca was recalled by her influence, raised to the praetorship, and appointed instructor of her son Nero. On the death of his governor and military tutor, Burrus, Nero gave way to his depraved passions with a force which Seneca could not control. All his influence over his pupil was lost, but he profited by his extravagant bounty to such a degree that his accumulated wealth amounted to 300,000 sester tia, or to \$12,209,000 of our money. Nero soon began to look with envious eyes on this fortune; and Seneca, to avert dangerous consequences, offered, with much tact, to refund to the emperor his gifts, and begged leave to retire on a small allowance. This Nero declined; and Seneca, under pretense of illness, shut himself up, and refused to appear in public. Nero then attempted to have him poisoned, but failed. A short time afterward, Antonius Natalis, when on his trial for participating in the conspiracy of Piso, implicated Seneca as one of the conspirators. This was quite enough to fix Seneca's guilt. He was sentenced to put himself to death. His wife, Paullina, declared her resolution to die with him, and, in spite of his remonstrances, accompanied him into the bath in which, according to his own choice, he was to be bled to death. The emperor, however, would not allow Paullina to die, but removed her from her husband, who gradually expired, 65 A.D. Seneca's extant writings are mainly on moral subjects, and consist of Epistles, and of Treatises on Anger, Consolation, Providence, Tranquillity of Mind, Philosophical Constancy, Clemency, The Shortness of Life, A Happy Life, Philosophical Retirement, and Benefits. He also speculated on physical phenomena, and wrote seven books entitled *Questiones Naturales*, in which he is thought to have anticipated some notions regarded as principles in modern physics. Ten tragedies, ascribed to him by Quintilian, and generally included in editions of his works, have also come down to us; but whether he is really their author remains still a dubious and debated point. Some allege that they were the work of his father, Seneca the rhetorician; some that they must be attributed to another Seneca. They were not intended, and are certainly not adapted, for the stage. They are overcharged with declamation; and, if rich in moral sentiments, are wanting in dramatic life. Of his genuine prose writings, modern opinion takes a divided view; some critics praising his practical sagacity, others finding him wanting in speculative reach. It is perhaps a significant fact, that he is admired by French scholars and disparaged by German. One of the best editions of the prose works is the Bipontine, 1809; of the tragedies, that of Bothe, 1819.

SENECA FALLS, a village in Seneca co., N. Y.; on the Seneca river near Cayuga lake, the Seneca and Cayuga canal, and the New York Central and Hudson River railroad; 16 miles w. of Auburn. The river here falls 50 feet, giving the name to the village and affording fine water-power. There are the convent of St. Patrick, public library, Mynderse academy, Mynderse park, three bridges across the river, national and savings banks, and manufactories of pumps and fire apparatus. Pop. '90, 6116.

SENECA LAKE, the largest and deepest of the group of small lakes in w. central New York; touching Ontario, Yates, Seneca, and Schuyler cos.; 37 miles long, 2 to 4 miles wide, 441 feet above the level of the Atlantic, and about 630 feet deep. It is navigable for steamboats its entire length.

SENECAS, a tribe of Indians, of the Six Nations, living in the state of New York w. of Seneca lake. Their tribal name is Tsonnundawaono, or "people of the great hill," receiving the name of Senecas from Dutch settlers who called them Sinnekaas. The tribe was originally divided into eight families, the Turtle, Snipe, Hawk, Bear, Beaver, Wolf, Deer, and Heron; and they gained from conquered tribes the Scannonaenrat (Hurons), and a majority of the Neuters, the Eries, and Susquehannas. They were visited by missionaries in the 17th c.—Chaumonot in 1657, and Fremin in 1668. La Salle built a block-house at Niagara without molestation, and the French built a fort there in 1712; but the Indians were hostile from time to time, and left the confederation of the Six Nations to join Pontiac in his league against the English, destroying Venango and making an assault on Fort Niagara in 1763. They were on the side of England during the revolution, and in 1779 their villages were destroyed by Gen. Sullivan. They joined in the Fort Stanwix treaty in 1784, selling most of their lands in the Genesee valley, and moved to lake Erie and the Alleghany river. In 1812 they joined with the Americans, and rendered valuable service on the frontier. A number living at Sandusky and Stony creek, Ohio, were hostile; but in 1815 they joined in a friendly treaty at Spring Valley, ceding all but a reservation with the Shawnees in 1818, selling that also in 1831, to go to the Indian territory on the Neosho. The New York Senecas

occupy 66,000 acres of reservation called the Alleghany, Cattaraugus, and Tonawanda, and near them are several large towns. They numbered in '90, 2683 in New York, in the Indian territory, 255, and 200 with the Mohawks on the Grand reservation in Canada. The society of Friends has done much to improve the condition of these tribes, and missions of different sects have been established since 1805. Each clan speaks a different dialect of the same language. The Rev. Ashur Wright, missionary, 1802-75, prepared a grammar and dictionary of their language, translated a portion of the Bible into it, and arranged a hymn-book. Red Jacket and Corn-planter were their most distinguished chiefs. They have prospered in agriculture and in religious and secular education, and have largely increased since 1812.

SENECIO, a genus of plants of the natural order *compositæ*, suborder *corymbifera*, having a hairy pappus, a naked receptacle, and a cylindrical involucre of linear equal scales, with a few smaller scales at their base. The species are very numerous; annual, perennial, and half-shrubby plants, natives chiefly of the temperate and cold parts of the world, the half-shrubby species being from the warmer latitudes. Eleven species are reckoned as British, and commonly known as groundsel (q.v.) and ragwort (q.v.). *S. Saracenicus*, probably not a true native of Britain, but introduced in the middle ages, has undivided lanceolate leaves, and was once in repute as a vulnerary. The FIREWEED of North America is *S. hieracifolius*. It receives its popular name from its appearing abundantly wherever a part of the forest has been consumed by fire. Many species of senecio have a strong disagreeable smell. A few are rather ornamental as flowers.

SENEFELDER, ALOYS, 1771-1834; b. Prague; studied law, and was afterwards an unsuccessful playwright and actor. By accident he discovered lithography, for which he obtained a patent. In 1809 he became director of the royal lithographing establishment at Munich. His *Lehrbuch der Lithographie* appeared in 1818. See LITHOGRAPHY.

SENEFFE, or **SENEF**, a village in the province of Hainaut, Belgium, about 22 m. s.w. of Brussels, had a pop. in 1894 of 3430 and is the center of a district in which manufactures of pottery and glass are extensively carried on. Seneffe, however, is chiefly notable for its proximity to the battlefield on which William of Orange (III. of England), at the head of the force of the coalition against France, was defeated, after a bloody contest, by the great Condé Aug. 11, 1674. In William's army there were four lieutenants—Montecuculi (q.v.), duke Charles of Lorraine, the prince of Waldeck, and the prince of Vaudemont, the first three of whom subsequently attained prominence as military commanders. Of the allied forces of 60,000 men, the Dutch lost from 5,000 to 6,000 men, the Spaniards 3,000, and the Imperialists 600; while the French army, which entered into the conflict 30,000 strong, could scarcely muster 20,000 after their victory.—Under the walls of Seneffe, Moreau in 1794 defeated the Austrians.

SENEGA, or **SNAKE ROOT**, is the dried root of *polygala senega*. The following are its characters: "A knobby root-stock, with a branched tap-root of about the thickness of a quill, twisted and keeled; bark, yellowish-brown, sweetish, afterward pungent, causing salivation; interior, woody, tasteless, inert." Senega is a powerful and trustworthy stimulating expectorant, and may be advantageously prescribed in the advanced stages of chronic bronchitis and pneumonia, especially when occurring in aged or very debilitated patients. It is also a valuable remedy in prolonged hooping-cough, and in the latter stages of croup and of bronchitis in young children. The preparations are the infusion and the tincture; the average dose of the former being an ounce and a half, of the latter a drachm. For children, the powdered root in doses of 10 grains is the best form. See POLYGALÆÆ.

SENEGAL' (called by the natives *Senaga*), a large river in western Africa, rises in Mt. Cooro, in lat. 10° 30' n., long. 10° 40' w., flows first n.w. and then w., and falls into the Atlantic after a course of 1000 m., for the last 740 of which it is navigable for flat-bottomed boats. Here and there, throughout the whole course, the navigation is interrupted by cataracts, shoals, and rocks. In the lower course the river forms numerous large, cultivated, and very fertile islands, and its banks are green and productive, and in part clothed with wood. The entrance is difficult on account of breakers and a bar which, in the dry season, is covered by only 8 to 9 ft. of water. It is navigable for some months by fair-sized steamers to Médiné (the further inland French station), 650 miles from the mouth. Thence the French were in 1883 making a railway to Bamoken on the Niger.

SENEGAM'BIA, a large maritime tract of country in western Africa, with very indefinite boundaries toward the east; it is bounded on the n. and w. by the Sahara and Soudan, on the s. by the colony of Sierra Leone, and on the w. by the Atlantic. Area about 400,000 sq.m.; pop. estimated at about 2,000,000. The country takes its name from its two principal rivers, the Senegal and the Gambia. Between these two rivers, which are 250 m. apart, there are no water-courses of any importance, and from the Gambia s. to the frontier of Sierra Leone, the only considerable stream is the Rio Grande. The coast is deeply indented by arms of the sea, which resemble the estuaries of rivers. The country forms the western and northern declivity of the plateau of Kong, and part

of it is still unexplored. The soil is of two kinds, that of the coasts and that of the interior; the former consisting in part of low flat alluvial plains, and partly of an undulating country, which broadens toward the n. until, on the northern frontier, it merges into the Sahara; while the plateau of the interior rises from the coast plains in mountainous terraces until it loses itself in the Kong mountains. Its loftiest elevations are only about 3,280 ft. high. Senegambia is divided into three districts—High, Middle, and Low Senegambia. The first comprises the country to the n. of the Senegal, and is inhabited by Moors, who, of course, profess Islamism. Middle Senegambia comprises the country bordering the Senegal, having an area of 1350 sq. m., and is inhabited by negroes, who divide themselves into numerous tribes. Of this tract the climate is extremely hot, and is unhealthy in the marshy districts. The soil is generally fertile, and yields the crops usually produced in the hot regions of Africa. Low Senegambia comprises the countries bordering the Gambia, and extends s. to Nunez. France possesses on the left bank of the Senegal (inland to Segou), and along the coast to the Gambia, about 96,000 sq. m. of territory; the Portuguese, a small tract on and around the estuary of the Rio Grande; and the English, some little territory on the Gambia. See *illus.*, *AFRICA*, Vol. I.

SENESCHAL (Teuton. *sene-scale*, senior servant?), in the origin of the office, probably an attendant of the servile class who had the superintendence of the household of the Frankish kings. In the course of time, however, the seneschalship rose to be a position of dignity, held no longer by persons of servile race, but by military commanders, who were also invested with judicial authority. The lieutenants of the great feudatories often took the title of seneschal. A similar office in England and Scotland was designated steward, but is rendered into Latin as *senescallus*.

SENIOR, NASSAU WILLIAM, political economist, 1790—1864; son of Rev. J. R. Senior, vicar of Durnford, Wilts; was educated at Eton and Magdalen college, Oxford, where he graduated in 1811, taking a distinguished first-class in classics. In 1819 he was called to the bar at Lincoln's inn. In 1825 he was elected to the professorship of political economy at Oxford, founded by the late Henry Drummond, M.P. He held it for the statutory term of five years, and was succeeded by Mr. Whately, afterward archbishop of Dublin. In 1832 the enormous evils of the poor-law administration in England led to the appointment of a commission of inquiry. Senior was one of the commissioners; and the portion of the report in which the abuses of the existing system were detailed was drawn up by him. This report encouraged the whig government to bring in the poor-law amendment act of 1834. See *POOR* and *POOR-LAWS*. In 1836 he received the appointment of master in chancery; and in 1847 was re-elected to his former professorship for another term of five years. More recently he was nominated one of the commissioners of national education, under the presidency of the late duke of Newcastle. His publications, which are numerous, comprise various excellent treatises on political economy, some of which were delivered in the form of lectures at Oxford, and several pamphlets on social and political questions. He also contributed numerous articles to the *Edinburgh Review*, and other leading periodicals. He has left some interesting journals of his visits to Turkey and Greece, and observations on the political and social condition of these countries. His *Essays on Fiction* contributed to the chief reviews between the years 1821 and 1857, and republished in 1864, relate principally to the novels of Scott, Bulwer-Lytton, and Thackeray. He analyzes the plots, and classifies the characters of the Waverley novels with curious felicity, and devotes a masterly essay to Thackeray, whom he regards as the greatest novelist of his day. The intellect of Senior was clear and penetrating, and the perspicuity of his style made him an able expositor of the truths of political and social science. His article on "Political Economy" in the *Encyclopædia Metropolitana*, and his remarks on some definitions in this science, published in the appendix to Dr. Whately's treatise on *Logic*, may be consulted with advantage.

SENILAC, BATTLE OF. The proper name for the Battle of Hastings. See *BATTLE*.

SENILIS, a very ancient t. of France, dep. of Oise, 25 m. n.n.e. of Paris. Its older portion is surrounded by walls, flanked with 16 towers, which are all that remain out of the 28 towers of early times. The cathedral, a small edifice, is a beautiful example of early Gothic. Manufactures of watch-springs etc. are carried on. Pop. '91, commune, 7116.

SENNÄ is one of the most important purgatives contained in our materia medica. Two sorts of senna are recognized in the pharmacopœia—viz., Alexandrian senna and Tinnevely senna. The Alexandrian senna leaves are chiefly obtained from *Cassia lanceolata*, while the Tinnevely senna leaves are yielded by *Cassia elongata*. Alexandrian senna is chiefly grown in Nubia and Upper Egypt, and is imported in large bales from Alexandria. It is apt to be adulterated largely with the flowers, pods, and leaves of *Cynanchum argel* and *Tephrosia apollina*. Tinnevely or East Indian senna in odor and taste entirely resembles Alexandrian senna. The leaflets are, however, "about 2 in. long, lanceolate, acute, unequally oblique at the base, flexible, entire, green, without any admixture."

Senna is, as Dr. Christison observes in his *Dispensatory*, "so certain, so manageable, and so convenient a purgative, that few remedies of its class are held in equal estimation. In point of energy, it holds a middle place between the mild laxatives and drastic cathartics. It acts chiefly on the small intestines, increasing their mucous secretion, as well as their peristaltic motion, and producing loose brown evacuations." The

drawbacks to its more universal administration are its disagreeable taste, and its tendency to produce nausea, griping, and flatulence; the means of correcting which are subsequently noticed. The only circumstance positively contra-indicating its employment is an inflammatory state of the intestinal mucus membrane. Although senna has been frequently submitted to chemical analysis, its active principle is not known; but whatever the cathartic principle may be, it is obviously absorbed into the circulation before it begins to operate, since this drug imparts a purgative property to the milk of nurses.

The following are the most important preparations of this medicine:

1. *Infusion of Senna*, which is obtained by infusing for one hour, and then straining, half an ounce of senna and half a dram of sliced ginger in half a pint of boiling water. The taste of this infusion is much concealed by the addition of some black tea, or what Neligan finds "still better, coffee, and it may be sweetened with sugar, and milk added; it is in this way readily taken by children." The addition of neutral laxative salts checks the griping, which is often caused by senna alone, and at the same time increases its activity. The ordinary *black draught* is commonly prepared by adding one ounce of sulphate of magnesia to four ounces of infusion of senna. Two or three ounces of this mixture, to which a dram each of the tinctures of senna and of cardamoms may be added, usually act as a very useful aperient.

2. *Tincture of Senna*, composed of senna, raisins, caraway seeds, and coriander seeds macerated in proof-spirit, and formerly known as *elixir salubris*, or the *elixir of health*, is seldom given alone. Christison recommends a mixture of an ounce of the tincture of senna with an ounce and a half of sulphate of magnesia, dissolved in four ounces of water, and as much infusion of roses. "A wine-glassful of this given every hour seldom fails to act with energy, and without sickness or tormina, and is an excellent combination for most febrile disorders." The tincture is, however, most commonly prescribed in doses of one or two drams, as an adjunct to other cathartic mixtures, to correct their griping properties.

3. *Confection of Senna*, commonly known as *lenitive electuary*, is a pulpy mixture of powdered senna with powdered coriander seeds, figs, tamarinds, cassia pulp, prunes, extract of liquorice and sugar; all of which substances are, under certain specified conditions, combined by the action of boiling water. When properly prepared, which is often not the case, it forms a mild aperient, well suited for persons suffering from piles.

In the above preparations, it is immaterial whether Alexandrian or East Indian senna is employed.

The senna leaves of commerce and of medicine are the produce of several species of *Cassia* (q.v.), natives of India, Arabia, Syria, and the n. of Africa. *Cassia obovata* is a perennial herbaceous plant 1 to 2 ft. high, having smooth leaves, 6 or 7 pair of obovate obtuse leaflets, racemes of yellow flowers, and curved, compressed pods, with an interrupted ridge along the middle of each valve. It is found in Egypt and Nubia, and is now also cultivated in Italy, Spain, the West Indies, etc. *C. acutifolia* is a half-shrubby plant, about 2 ft. high, with racemes of yellow flowers, lanceolate acute leaves, and flat elliptical pods, somewhat swollen by the seeds. It grows in the deserts near Assouan, and the leaves are collected by the Arabs, and carried by merchants to Cairo for sale.—*C. elongata* is an annual with erect, smooth stem; narrow leaves, with 4 to 8 pair of lanceolate leaflets, which are rather downy beneath; racemes of yellow flowers; and oblong pods, quite straight, rounded at the apex, and tapering to the base. It grows in India.—*C. ethiopica* is about 18 in. high, with 3 to 5 pair of oval-lanceolate, downy leaflets; the pods flat and smooth. It grows in the n. of Africa.—*C. lanceolata* is an Arabian species, differing from the others in its erect pods.—All these seem to furnish the officinal senna. Linnaeus, not aware of the diversity of species, assigned it to one which he named *C. senna*, but it would be hard to say which has a preferable claim to this name. All the species have the leaflets unequal-sided, by which they are readily distinguished from other leaflets often used for the adulteration of senna, as those of *argel* (q.v.) and *bladder senna*. The commercial names of the different kinds of senna do not seem in general to correspond with differences of species, but rather to refer to the countries or ports from which they are brought.

BLADDER SENNA (*Colutea*) is a genus of shrubs of the natural order *leguminosæ*, sub-order *papilionacæ*, having pinnated leaves, red or yellow flowers, and remarkably inflated pods, whence the English name. One species (*C. arborescens*) is common in shrubberies in Britain. It is a native of the s. of Europe, and is found on the ascent of the crater of Mt. Vesuvius—almost the only plant that exists there.

SENNAAR, lately a negro state, is now an Egyptian pashalik in the s. of Nubia. The town from which it is named, *Sennaar*, near the Bahr-el-Azrek, and 160 m. s.s.e. of Khartoum, was once a most important city, but is still a trading center of some consequence.

SENNACH ERIB, an Assyrian king, son of Sargon, reigned 705–681 B.C. The interest attaching to his name is principally due to the extraordinary and incomprehensible disaster that befell his army, either at Libnah or at Pelusium, when no fewer than 185,000 Assyrians are said to have been slain by the "angel of the Lord" (see HEZEKIAH). The

Egyptian account of this mysterious affair (reported by Herodotus, book ii. 141), and that of Berosus the Chaldean, quoted by Josephus (*Antiq. of Jews*, book x. chap. 1), as well as the scriptural narrative (2 Kings, chap. 18) justify us in believing that Sennacherib at least sustained a sudden, unexpected, and terrible overthrow, which forced him to retreat in hurried confusion to his own country. All that we know of his subsequent history is, that he was assassinated by his sons while worshiping his favorite god. The discrepancies, both as regards dates and names in the life of Sennacherib, between the writer of Kings and profane historians, are felt, even by strenuous apologists like the Rev. George Rawlinson, to be almost, if not altogether, irreconcilable. Sennacherib belongs to that showy class of eastern monarchs whose rule is commonly described as "magnificent"—i.e., he built great palaces, and erected monuments in the different parts of his empire, and everywhere left an impression of his grandeur. In Scripture, in Herodotus, in Josephus, Sennacherib is the "great king." His most imperial work was the palace at Koyunjik, which covered a space of more than 8 acres, and was richly adorned with sculpture. See *illus.*, NINEVEH AND ASSYRIA, vol. X.

SENS, a city of France, in the department of Yonne, 61 m. s.e. of Paris, stands amid pleasing scenery on the right bank of the Yonne. The town proper is surrounded by walls, chiefly of Roman construction, and in the vicinity the remains of ancient roads and of Roman camps abound. The spacious and handsome Gothic cathedral is the principal edifice. An active trade is carried on. There are tanyards and manufactories of chemical manure and agricultural implements. Pop. '91, 14,006.

SENSATION (in physiology) may be defined to be "the perception by the mind of a change wrought in the body." According to this definition, which is borrowed from Dr. Todd, sensation involves—first, a bodily change from some cause, whether inherent or external; and secondly, a mental change, whereby the perception of the bodily change is accomplished. The true organ of sensation is the brain, and especially that portion of it which (to use the words of the above-named eminent physiologist) constitutes the center of sensation, and extends into the spinal cord, forming the posterior horns of its gray matter. See SPINAL CORD. Physiologists distinguish between *common* and *special* sensation. Common sensation exists in the skin, and in all parts of the body to which ordinary sensory nerves are distributed, and is excited by ordinary mechanical or chemical stimuli; while special sensation is exemplified in the special senses of vision, hearing, etc. For the due action of the latter there are organs of special sensation, which, by the peculiar character of the nerves with which they are supplied, become the recipients of impressions of a particular kind; thus, the eye is sensible to light, the ear to sound, etc.; and if the special nerves going to these organs be irritated, instead of pain being excited, as in the case of an ordinary sensory nerve, there is a feeling closely allied to that which would be excited by the application of the normal stimulus, as light, sound, etc. Any *ordinary* sensibility those organs (the eye, ear, etc.) possess is dependent on ordinary sensory nerves, and is quite independent of the nerves of special sense.

In works on the physiology of the nervous system, we often meet with the phrases *objective sensation*, *subjective sensation*, and *reflex sensation*. We shall conclude this article by a brief description of the meaning of these terms. "In the ordinary mode of exciting sensations," says Dr. Todd, "the presence of an object is necessary. This object creates an impression on the peripheral parts of the sensitive nerves; and the change caused by this impression being duly propagated to the center of sensation, is perceived by the mind." This, which is the ordinary form of sensation, is termed an *objective* sensation, in opposition to a so-called *subjective* sensation, in which a mental act can develop a sensation independently of any present object. These subjective sensations are sometimes excited by the mind recalling, more or less exactly, the presence of an object; but in many cases they are caused by physical changes in the nerves themselves, owing to an excess or deficiency of blood, or some other pathological causes. Thus disordered conditions of the retina or optic nerve may give rise to motes or flashes of light; disturbance of the auditory nerve occasions singing in the ears, the sound of distant bells, etc.

To understand the mode in which *reflex* sensations are brought about, an acquaintance with *reflex action*, described in the article entitled NERVOUS SYSTEM, is requisite. As examples of this form of sensation may be mentioned the facts, that the irritation of a calculus in the bladder will give rise to pain in the thighs; that diseased liver often excites pain in the shoulder-joint; and that ice or iced drinks suddenly introduced into the stomach occasion intense pain in the forehead. For further information on the subject, see Todd's *Cyclopædia of Anatomy and Physiology*, vol. IV.

SENSATION, a name of great import in the philosophy of mind, as well as familiar in ordinary speech. In the mental process so named, there is a concurrence of many contrasting phenomena, rendering the word ambiguous, and occasioning verbal disputes.

1. In sensation there is a combination or concurrence of physical facts with a mental fact, and the name is apt to be employed in expressing either side. Thus, in sight, the physical processes are known to be—the action of light upon the globe and retina of

the eye, a series of nerve-currents in the brain, and a certain outgoing influence to muscles and viscera; these are accompanied by the totally different phenomenon termed the feeling, or the mental consciousness of light. It is to the last fact, the mental fact, that the name sensation is most correctly applied; but there is a natural liability to make it include those physical adjuncts which are inseparable from the mental manifestations.

2. In the still more comprehensive contrast of mind and the external or extended world, both members may be designated under sensation. One and the same situation on our part may contain a strictly mental or *subjective* experience—pleasure or pain, for example—and an *objective* experience, or a recognition of the extended world, as distinct from mind. In looking at a fine prospect, both facts concur in fluctuating proportions; we have a feeling of pleasure (mind or subject) and a knowledge of the outspread or extended world (object), which is what affects us in the same way at all times, and affects all minds alike. As before, sensation is most properly used to express the strictly mental or subjective experience, the pleasure or the pain, while the “perception” should be applied to express the objective experience. See PERCEPTION.

3. In sensation, a past experience recovered by memory is inextricably woven with the present impression, a circumstance which confuses the boundary-line between sense and intellect. The sensation that the full moon gives rise to is not solely owing to the present effect of the moon’s rays on the organs of vision; the present effect revives or restores the total ingrained impression of the moon consequent on all the occasions when we have observed it. Again, it is impossible for us to have a sensation without a more or less complex feeling of difference or discrimination, which property is a fundamental fact of intellect. Our sensation of the moon supposes a contrast of the white light with the adjoining blue, of the round form with other forms, of the broad disk with a starry point, and so on. Thus, in sensation we have a concurrence of all three processes of the intellect—retentiveness, agreement, and difference. Sensation without intellect is a mere abstraction; it is never realized in fact.

This last remark has important bearings upon the question as to the origin of our knowledge. It has been disputed whether or not our ideas are wholly derived from sense. Now, seeing that there is no such thing as sense to the exclusion of intellect, the question ought to be enlarged and put in this form: Are our ideas wholly derived through sense in conjunction with the intellectual processes, or are there any ideas that are not or cannot be so derived? When it is alleged by Cudworth, Price, and others, by way of maintaining the doctrine of innate ideas, that likeness, unlikeness, equality, proportion, etc., are not obtained from sense, the answer is, that their origin may in all probability be accounted for by sense co-operating with the well-known powers of the intellect, and that, until the conjunction of the two is proved insufficient, the theory of an intuitive origin is not called for.

SENSES. Referring for an account of the several senses to their respective designations, we will here endeavor to state what faculties or sensibilities of the mind are properly included under the name.

The common reckoning includes the five senses—taste, smell, touch, hearing, sight—but this is not now considered exhaustive or complete.

For example, the feelings of hunger, thirst, suffocation, internal warmth and chillness, etc., have all the characters implied in an ordinary sensation: they are the result of some external agent acting on a distinct bodily organ, and giving rise to feeling, sometimes pleasurable and sometimes painful. In order that these states, related to the sensibility of the different viscera, may find a place among the senses, they have been grouped under one general head, and designated “sensations of organic life.” They are of great importance as regards our enjoyments and our sufferings, although not contributing much to our knowledge or intelligence. They approach nearest to taste and smell, the more emotional senses, and are at the furthest remove from the intellectual senses—touch, hearing, and sight.

Again, the feelings connected with our activity, or with the exercise of the muscular organs—as the pleasures of exercise and rest, the pains of fatigue, the sensibility to weight, resistance, etc.—were, until lately, overlooked in the philosophy of the mind. When they began to be recognized it was common to treat them as a sixth sense, called the muscular sense. But this does not represent their true position. They do not arise from external agents operating on a sensitive part, but from internal impulses proceeding outward to stimulate the muscular energies, and to bring about movements; they are thus the contrast of the senses generally. Sense is associated with the *in-going* nerve-currents, movement with the *out-going*. The contrast is vital and fundamental; and accordingly the feelings of movement and muscular strain should be considered as a genus distinct from the genus sense, and not as a species of that genus.

The classification of the fundamental sensibilities of the mind would then stand thus: I. Feelings of muscular energy. II. Sensations of the senses: 1. Organic life; 2. Taste; 3. Smell—emotional; 4. Touch; 5. Hearing; 6. Sight—intellectual.

SENSIBILITY is a term somewhat vaguely used by physiologists. Until a comparatively recent period it was often confounded with irritability, although Haller, more than a century ago, very clearly laid down the distinction between these two properties of tissues. We not unfrequently find it applied to nerves to signify their power of evol-

ing nervous force, but excitability (as Dr. Todd observes) more exactly implies what is meant in this case. The term should be limited to signify the power which any part of the body possesses of causing changes, inherent or excited in it, to be perceived by the mind; and the greater this power is, the greater is the sensibility of the part. The degree of sensibility of different parts of the outer surface of the body is very various. The relative sensibility has been ascertained by Weber by touching the surface with the points of a pair of compasses tipped with cork, and then (the subject's eyes being closed) by approximating the points until they were brought within the smallest distance at which they could be felt to be separate. The following are a few of his results: Point of tongue, $\frac{1}{2}$ a line; tips of fingers, 1 line; red surface of lips, 2 lines; palmar surface of 2d phalanx, 2 lines; palmar surface of metacarpus, 3 lines; tip of the nose, 3 lines; palm of the hand, 5 lines; dorsum of the hand, 8 lines; vertex, 15 lines; skin over the spine and the middle of the thigh, each 30 lines; so that the sensibility of the skin is at least sixty times greater in some parts than in others.

SENSITIVE PLANT, a name commonly given to certain species of *mimosa*, (see *MIMOSEÆ*), on account of the peculiar phenomena of irritability (q. v.) which their leaves exhibit in their collapse when touched or shaken. Numerous species of *mimosa* possess this property, and, indeed, most of the species in a greater or less degree; but those in which it is most conspicuous are humble herbaceous or half-shrubby plants. They have leaves beautifully divided, again and again pinnate, with a great number of small leaflets, of which the pairs close upward when touched. On repeated or rougher touching, the leaflets of the neighboring *pinnæ* also close together, and all the *pinnæ* sink down, and at last the leaf-stalk itself sinks down, and the whole leaf hangs as if withered. If the stem is shaken, all the leaves exhibit the same phenomena. After a short time the leaf-stalk rises, and the leaflets expand again. On account of this curious and interesting property, some of the sensitive plants are frequently cultivated in our hot-houses. They are generally treated as annuals, although capable of longer life. *M. sensitiva*, one of the best-known species, is a native of Brazil, with prickly stems and leaf-stalks, and small heads of rose-colored flowers. *M. pudica* has a herbaceous stem, bristly but not prickly. *M. casta*, *M. pubibrunda*, *M. palapitans*, and *M. Viva* are also among the most sensitive species.

SENSORIUM. This term is applied by physiologists to a series of ganglionic centers, each of which has the power of communicating to the mind the impressions derived from the organ with which it is connected, and of exciting automatic or involuntary muscular movements in response to these sensations. (See Carpenter *On the Functions of the Nervous System in Human Physiology*, 6th ed. p. 545.) These ganglionic centers, which lie at the base of the brain in man, are in direct connection with the nerves of sensation, and appear to differ entirely in their functions from the other parts of the encephalon. Anterior, there are the *olfactive* ganglia, or what are termed the bulbs of the olfactive nerves. The ganglionic nature of these structures is more evident in many of the lower mammals, in whom the organ of smell is highly developed, than it is in man, although even in the human subject these masses contain gray or vesicular nervous matter, indicating their true ganglionic nature. Behind these, we have the *optic* ganglia, commonly known as the corpora quadrigemina, small in man, but comparatively large in many of the lower mammals. The *auditory* ganglia do not form distinct projecting masses, but are represented by small masses of vesicular matter, into which the auditory nerves may be traced, and which are imbedded in the medulla oblongata. In fishes there is a well-developed and distinct auditory ganglion. The *gustatory* ganglion is the least distinct of any, but it is supposed to be represented by a mass of vesicular matter imbedded, like the preceding ganglion, in the medulla oblongata, and into which the nerves of taste may be traced. On examining a progressive series of brains from man to the lowest mammals, we find a continuous diminution of the hemispheres and a corresponding development of these ganglia, or, at all events, of the olfactory and optic ganglia; while, if we continue the investigation to the brains of birds, reptiles, and fishes, we find the same law in force, till finally, in reptiles and fishes, those ganglia form the greatest part of the brain.

It was long attempted to determine some one point in the brain where the soul is more especially located or centralized, and to this ideal point the name of Sensorium was applied in the older psychological speculations. The fancy of Descartes made it a small body near the base of the brain, called the "pineal gland." The recent views of the nervous system repudiate the idea of a central point of this nature; in consciousness the brain generally is active, although under different impressions and ideas the currents may be presumed to follow different nerve tracks. Consequently no meaning is now attached to a sensorium in psychology, as distinct from the cerebrum at large.

SENTENCE. A sentence is the form of words in which a thought or a proposition (q. v.) is expressed. A mere phrase or group of words, such as "A very high mountain," which only conveys a meaning or calls up an idea, but does not make an affirmation, is not a sentence. Since speech is the expression of thought, the sentence is the proper unit or integer of speech, and thus forms the starting-point in the study of language.

Every single sentence is made up of two parts—the one naming the subject, or the something that is spoken about; the other the predicate, or the something that is said

of it—as “The sun—shines;” “Those who have the greatest gifts, and are of the greatest usefulness—are the most humble.” Every sentence must contain a finite verb, as it is the function of the verb (q.v.) to make affirmations. “The sun shines,” is an example of a sentence in its barest form, containing merely the subject “sun,” and the predicate “shines,” which are called the *principal* elements. The enlargement or development of the sentence takes place by means of adjuncts, or *secondary* elements tacked on to the principal elements—as “*Young birds build nests without experience.*” Sentences may be divided into simple, compound, and complex.

1. A simple sentence has only one subject and one finite verb. Reduced to its essentials, it is of the form, “The sun shines;” “The day is cold.” 2. A compound sentence consists of two or more simple sentences combined—as, “The sun gives light by day, and the moon by night;” which contains two affirmations or sentences, “The sun gives light by day,” and “The moon gives light by night.” 3. A complex sentence consists of one principal sentence together with one or more dependent sentences. In the compound sentence given above, there are two distinct statements, and as both are put on the same footing they are said to be *co-ordinate* sentences. But when we say “The moon rose as the sun went down,” the going down of the sun is not mentioned on its own account; the only thing directly affirmed is that the moon rose at a certain time, and the going down of the sun is only introduced as marking that time. Such clauses are called *subordinate* sentences (see CONJUNCTIONS). The subordinate clauses of complex sentences may be considered as transformations of the elements of the simple sentence; and according to the nature of the element which has been transformed, they might be called noun-sentences, adjective-sentences, or adverbial-sentences—e.g., “*The existence of God is denied by none*” = “*That God exists, is denied by none.*” “*Benevolent men are happy*” = “*Men who seek the good of others are happy.*” “The moon rose at sunset” = “The moon rose as the sun went down.” Further, the nouns, adjectives, and adverbs that enter into a subordinate sentence, may, one and all of them, be transformed in their turn into sentences, which will thus be subordinate in a still higher degree—e.g., “Europe rejoiced that Greece was delivered from that oppressive power” = “Europe rejoiced that Greece was delivered from the power that had oppressed her.” Here the adjective *oppressive* in the first sentence has in the second been converted into a sentence which is directly dependent, not on the principal sentence (Europe rejoiced), but on the subordinate, and is therefore subordinate in the second degree. Subordination is seldom carried beyond the second or third degree, as it becomes perplexing, and weakens the force of the principal assertion. The same sentence is often compound, as containing two or more co-ordinate sentences, and at the same time complex, as containing one or more subordinate sentences in addition; and to discriminate all these and point out their relations is to give the syntactical analysis of the sentence.

SENER, ISAAC, 1755–99; b. N. H.; educated at Yale college. He was a surgeon in the continental army, and afterward the head of the medical profession in Rhode Island.

SENTINEL—SENTRY (from the Lat. *sentire*, to feel or perceive, through the Ital. *sentinella*), a private soldier, marine, or sailor posted at a point of trust, with the duty of watching the approach of an enemy or any person suspected of hostile intentions. Sentries mount guard over depots of arms, the tents of commanding officers, etc. During the night each sentry is intrusted with the “word,” or countersign: and no person, however exalted in position, may attempt to approach or pass him without giving that as a signal. In such case the sentry is bound to arrest the intruder, and, if necessary, to shoot him. It has happened before now that the commander-in-chief of an army has been a prisoner in the hands of one of his own sentries. When an army is in the field the sentries are its eyes, for they guard the approaches in every direction some distance in front of the main body of troops. In the event of attack they give the alarm and retire slowly on their supports. There is usually an agreement, tacit or expressed, between commanders that their outlying sentries shall not fire upon one another, which would only be productive of useless bloodshed. Under martial law death is the penalty to a sentry for sleeping on guard.

SENZA SORDI NO (Ital. without the mute, or without the damper), a musical term which, when applied to the violin or violoncello, denotes that the mute (q.v.) is to be removed. In pianoforte music it means that the performer must press down the pedal which takes off the dampers.

SEPAL. See CALYX.

SEPARATE ESTATE is the legal term denoting the property of a married woman, which she holds independently of her husband's interference and control. Where a marriage is about to be entered into, and the lady has property, it is usual, before the marriage, for her to assign and convey to trustees all or part of her property, so that it may continue to be vested in them for her exclusive benefit, and so that she may be able to deal with it in much the same manner as if she were not married. The deed in that case entirely regulates the extent of her rights. Where the deed has been properly executed she can draw the interest, and do what she pleases with it. A third party who bequeaths property to a married woman may also so give it as to make it separate estate.

If there is no clause in the deed or will prohibiting alienation or anticipation, she will be able to dispose of her life-interest. She can, in general, alienate her separate estate without her husband's consent; and she is not bound out of it to maintain the husband, even though he may be destitute; nor is she bound to maintain her children, unless the latter would otherwise be chargeable to the parish.

It is not as usual in the United States to make these ante-nuptial settlements upon a proposed wife as in England; nor indeed is it as necessary, for in nearly all the states a married woman may have and manage her separate estate as if she were single. In N. Y., a married woman may sue and be sued in her own name with reference to her separate estate, may contract debts, enter into partnership arrangements without her husband's consent, and do all other acts with reference to her separate estate that a single woman might do.

SEPARATE LUTHERANS are those followers of Luther who in Prussia refuse to unite with the state church. In 1817 Frederick William III. formed a plan for uniting the Reformed and the Lutheran churches; but many zealous Lutherans were opposed to it, and found a leader in Johann Gottfried Scheibel, professor of theology at the university of Breslau. In 1830 two cabinet orders, designed to further the scheme, caused an open breach. Several distinguished men, many ministers, and nearly 300 families, joined Scheibel. He was soon driven into exile, and died at Nuremberg in 1842. His followers adhered to their principles. The government employed against them both policemen and soldiers. Ministers were imprisoned, laymen fined, and religious meetings dispersed. Many families emigrated to America, but the enthusiasm of the rest increased. In 1840 Frederick William IV. released the ministers from prison, allowed the congregations to organize themselves, and in 1845 recognized their right to unite under their own officers free from the control of the state church. The official acts of their ministers were to be acknowledged in law, and their church registers to be received in evidence. Under these provisions a high consistory was constituted as the supreme ecclesiastical authority for separate Lutherans in Prussia. It consists of 4 members, and has charge of the spiritual welfare of the church, of receiving new congregations, of parochial relations, the appointments of clergymen, the ritual, censures, complaints, and the calling of synods. The processes of discipline are admonition, requisition of apologies, and excommunication. The church service is conducted according to the received forms; preaching on free texts requires permission from the high consistory, and the Lord's supper is an essential part of the chief service. Lutherans are not compelled to send their children to the united schools. In 1847 the high consistory had under its charge 21 congregations with 19,000 members. A very large number of Lutherans, influenced by the king's concessions, remained in the state church. The great political movement of 1848 gave a powerful impulse to the separate Lutherans; but as it also encouraged their brethren in the state church to strive within it, rather than out of it, for greater independence, the alienation between the two parties was increased. In later years the separate Lutherans have been divided among themselves. In 1861 two parties were formed, the one conservative and the other radical, between which friendly intercourse ceased.

SEPARATION of married persons is either judicial or voluntary. If the parties enter into a deed, or other arrangement, to live separate, this is called a voluntary separation, and, in general, the legal rights of the parties are not altered, except that if the wife is provided with maintenance, she has no longer an implied authority to bind the husband. And though voluntary separation is not encouraged by courts of law, yet effect will be given frequently to deliberate contracts of this kind entered into between the parties. See JUDICIAL SEPARATION.

SEPARATISTS. See QUAKERS, OATH.

SEPIA AND SEPIADE. See CUTTLE-FISH.

SEPIA, a pigment used as a water-color. It is prepared from the secretion of a peculiar organ called the ink-bag, found in the dibranchiate *cephalopoda*, or cuttle-fishes. This secretion is black at first, and insoluble in water, but extremely diffusible through it; it is therefore agitated in water to wash it, and then allowed slowly to subside, after which the water is poured off, and the sediment, when dry enough, is formed into cakes or sticks. In this state it is called "India ink." If, however, it is dissolved in a solution of caustic potash, it becomes brown, and is then boiled and filtered, after which the alkali is neutralized with an acid, and the brown pigment is precipitated and dried: this constitutes the proper sepia. It is usually prepared in Italy, great numbers of the species which yields it most abundantly, *sepa officinalis*, being found in the Mediterranean. The black kind, called India ink, is prepared in China, Japan, and India, and forms the common writing-ink of those countries.

SEPOY, corrupted from the Indian word *sipahi*, a soldier. This word *sipahi*, in its more familiar form of *spahis*, is known in most eastern armies; and is itself derived from *sip*, a bow and arrow, the ordinary armament of an Indian soldier in ancient times. The word sepoy now denotes a native Hindu soldier in the British army in India. See EAST INDIA ARMY. The present sepoy force numbers about 140,000.

SEPTARIA are ovate flattened nodules of argillaceous limestone, internally divided into numerous angular fragments by reticulating fissures radiating from the center to the circumference, which are filled with some mineral substance, as carbonate of lime

or sulphate of barytes, that has been infiltrated subsequent to their formation. The fissures have been produced by the cracking of the nodule when drying. They are largest and most numerous in the center, and gradually decrease outward, showing that the external crust had first become indurated, and so, preventing any alteration in the size of the whole mass, produced wider rents as the interior contracted. The radiating figure, and the striking contrast between the dark body of argillaceous limestone and the more or less transparent sparry veins, when the nodule is cut and polished, has caused them to be manufactured into small tables and similar objects. They are, however, most extensively employed in the manufacture of cement. As they are composed of clay, lime, and iron, they form a cement which hardens under water, and which is known commercially as Roman cement, because of its properties being the same as a famous hydraulic cement made of ferruginous volcanic ash brought from Rome. Septaria occur in layers in clay deposits, and are quarried for economical purposes in the clays of the London basin. Large numbers are also dredged up off Harwich, which have been washed out of the shore-cliffs by the waves. The nodules generally contain a scale, shell, plant, fruit, coprolite, or some other organic substance, forming the nucleus that has apparently excited the metamorphic action which withdrew from the surrounding clay the calcareous and ferruginous materials scattered through it, and aggregated them around itself. See illus., MICROSCOPIC PICTURES, vol. IX.

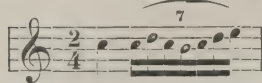
SEPTEMBER (Lat. *septem*, seven) was the 7th month of the Roman calendar, but is the 9th according to our reckoning, though we preserve the original name. Various Roman emperors, following the example of Augustus, who changed "Sextilis," the 6th month of the Roman calendar, into "Augustus" (August), attempted to substitute other names for this month, but the ancient appellation continued to hold its ground. The Saxons called it *gerst-monath*, or barley-month, because barley, their chief cereal crop, was generally harvested during this month. It has always contained 30 days.

SEPTEMBRISTS—SEPTEMBRISERS (Fr. *Septembriseurs*), the name given to the frantic executioners in what are known as the "September massacres" in Paris. The particular causes of this ferocious outburst were twofold—mad fear of domestic traitors and of foreign despots. The news came pouring into Paris, ever more and more maddening, of Prussian and Austrian hordes marching victorious over the frontiers; insolent royalists obtruding themselves in the van of the invading armies, and breathing threatenings and slaughter; while numerous *aristocrates* (i.e., favorers of the king and court) were believed to be making preparations to receive them in Paris. At the very same moment broke out the royalist insurrection in *La Vendée*, rendering France still further delirious, whereupon Danton, "minister of justice," got a decree passed, Aug. 28, 1792, ordering domiciliary visits for the arrest of all suspected persons, and for the seizure of arms of which patriotic France stood much in need. Upward of 2,000 stand of arms were got in this way, and 400 head of new prisoners. On the morning of Sept. 2 the news of the capture of Verdun by the Prussians arrived. The mingled rage and panic of the people cannot be described. All the bells in Paris were set a-clanging; men and women hurried in myriads to the *Champ de Mars* to get themselves enrolled as volunteers. Danton entered the legislature—"the black brows clouded, the colossus-figure tramping heavy, grim energy looking from all features of the rugged man"—and made that famous speech, ending: "*Pour les vaincre, pour les atterrir, que fuit-il? De l'audace, encore de l'audace, et toujours de l'audace.*" The effect was electrical. He obtained from the assembly a decree condemning to death all "who refused to march to the frontiers or to take up arms." But patriotism against foreigners was not enough. Were not the traitors at home deserving of death? Marat thought so: multitudes of ardent frantic men and women shared his conviction; but it is not proved that either Marat or Danton formally ordered the massacres, or, indeed, that anybody ordered them. They were rather the spontaneous outburst of patriotic insanity, beholding aristocratic treachery and plots everywhere. Priests, Swiss soldiers, aged and infirm paupers, women both reputable and disreputable, and criminals, were mercilessly cut down or shot. From Sunday afternoon till Thursday evening the wild butchery went on at the Bicêtre, the Abbaye, the convent of the Carmelites, the Conciergerie du Palais, the Grand Châtelet, St. Firmin, La Force, and the Salpêtrière. One gathers a glimpse of the savage sincerity of the Septembriseurs when one reads that the gold rings, watches, money, etc., found on the persons of the massacred were all religiously brought to the town-hall; not a single thing was stolen or furtively appropriated until after the essential work was done. Then the roughs or blackguards ("sons of darkness," as Carlyle calls them) sallied out into the streets like Mohawks or Alsatians, and commenced to plunder, but were speedily suppressed and forced back into their dens.

Great misapprehension prevails as to the numbers who perished in these fearful scenes. Royalist pamphleteers and others, trusting mainly to fantasy (according to Carlyle, *Fr. Rev.*, vol. ii. p. 158) reckon the victims at 3,000, 6,000, and even 12,000; but the accurate advocate Maton (who was in the thick of the horrors, and narrowly escaped the guillotine) reduces the number, by "arithmetical ciphers and lists," to 1089, which, be it observed, included numbers of forgers of assignats, and other criminals. It was a sad and horrible affair, as all massacres are; but it is above all things desirable to know

exactly the *dimensions* of, and the motives that stirred the actors in, so execrable a tragedy.

SEPTIMOLE, in music. When a note is divided into 7 instead of 4 parts—for example, a minim into 7 quavers, or a crotchet into 7 semiquavers—the group is called a septimole,



and the figure 7 is generally placed over it. A septimole

may also occur in a § measure, in which case the 7 notes are collectively of the value, not of 4, but of 6.

SEPTUAGESIMA SUNDAY (Lat. *Septuagesima*, "the seventieth"), the third Sunday before *Lent* (q. v.), so called, like "*Sexagesima*" and "*Quinquagesima*," from its distance (reckoned in round numbers) before Easter.

SEPTUAGINT (Gr. *Hoi tōn O*, or *hoi O*; Lat. *Septuaginta*; Seventy, LXX., Alexandrine version, etc.), the most ancient Greek translation of the Old Testament that has come down to us, and the one commonly in use among the Jews at the time of Christ. Its origin is shrouded in deep obscurity. The principal myth about it—repeated by Philo, Josephus, the Talmud, and the church fathers (Justin, Clement of Alexandria, Epiphanius, and the rest), with individual variations—is contained in a letter purporting to be written by a Greek, Aristaeus, to his brother, Philocrates, during the reign of Ptolemy Philadelphus (284–247 B. C.). This king, it is stated, anxious to embody in a collection the laws of all nations on which he was engaged, also those of the Jews, invited, by the advice of his librarian, Demetrius Phalereus, 72 men of learning and eminence from Palestine, who performed the task of translation (on the isle of Pharos) in 72 days. The facts upon which this legend—utterly rejected now as a piece of history—rests, cannot well be ascertained now. So much, however, seems clear from another anterior testimony (Aristobulus), that Ptolemy, aided by Demetrius, did cause a Greek version of the Pentateuch to be executed, probably during the time of his being coregent of Ptolemy Lagi. That the translator or translators, however, were not Palestinian but Egyptian Jews, appears equally clear both from the state of the text from which the translation must have been made, and from the intimate acquaintance with Egyptian manners and customs which it evinces. This text differs, especially in the Pentateuch, considerably from our received text, but agrees in many instances with the Samaritan (q. v.). The question of the number of translators has been much and warmly discussed, but with little positive result. So much only seems certain, that different hands were employed in the rendering of the different parts of the Pentateuch, upon which infinite care was bestowed, as well as of the other books of the Old Testament, which, indeed, do not seem to have been done at the same time. In some instances, it would appear as if the translation had been made before the non-pentateuchial books were united with the others into one canon. This seems particularly evident in the case of the book of Jeremiah, which, in the translation, appears in a more primitive form than in the state in which we possess it now. In a less degree does this discrepancy appear in Job, the Proverbs, Daniel, and Esther; of these, however, our canon probably contains the original form, while the LXX. shows later variants. It is, however, in neither of these books to be decided now whether the discrepancies observable are due to an already altered text upon which the translators worked, or whether they were their own emendations; or even whether many of them are not due to a much later period. The translation of the book of Daniel is the most flagrant instance of subsequently introduced "corrections" and additions. Apart from the apocryphal pieces attached to it, its obscure passages were "emendated" to such an extent by both Jews and Christians, that it was by the authority of the early church utterly rejected, and replaced by the version of Theodotion. The translator of Job, though less arbitrary, has yet altered, added to, and abbreviated considerably, his text. Esther has many apocryphal additions, which owe their origin probably to the Alexandrine period, and never existed in Hebrew. Of exaggerated literalness is the version of Ecclesiastes and the Psalms. Among the most successful books are to be mentioned the Psalms and Ezekiel. But, on the whole, there is to be noticed throughout, a lack of an exact knowledge of the original, a striving after minute fidelity in one part, and an unbridled arbitrariness in another; further, a desire to tone down or to utterly eliminate anthropomorphisms or anything that appeared objectionable to the refined taste of the time.

The Septuagint was held in the very highest repute among the Alexandrine Jews, while the Palestinians looked upon it as a dangerous innovation, and even instituted the day of its completion as a day of mourning. Gradually, however, it also found its way into Palestine, and at the time of the composition of the New Testament it seems almost to have superseded the original, considering that its quotations from the Old Testament are almost invariably given from the LXX. It was read and interpreted in the synagogues for some centuries after Christ, until the increasing knowledge of the original, fostered by the many academies and schools and the frequent disputations with the early Christians, brought other and more faithful and literal translations, such as that of Aquila, Theodotion, etc., into use, and gradually the LXX. was altogether discarded

in the synagogue. The church, however, for a long time, and the Greek church up to this day, considered it as of equal authority and inspiration with the Hebrew text itself; and many translations were made from it into the vernaculars of different Christian communities (the Itala, the Syriac, the Ethiopian, Egyptian, Armenian, Georgian, Slavonian, etc.). The large diffusion of the LXX. among the Hellenists and the churches, and the want of anything like a critically fixed text, together with the pious desire bodily to insert the peculiar explanation given to obscure passages by single authorities, the ignorance of the copyists, and a number of other causes, contributed not a little to render the MSS. corrupt, in some instances past mending. Nor were the endeavors of Origenes (q.v.) in his *Hexapla*, or of Lucianus and Hesychius for a restoration of the proper text of any avail. The principal MSS. that have, as far as we know, survived are the Codex Alexandrinus in the British museum, the Codex Vaticanus in Rome, and the Sinaitic Codex (imperfect) in St. Petersburg, all of which belong to the time between the 4th and 6th centuries A.D. The principal editions are the Complutensian (1514-17), reprinted in the Antwerp and Paris Polygot; the Aldine of Venice (1518); the Sixtine of Rome (1587), partly reprinted in Walton's Polygot (1657), by Lamb Bos. (Franeker, 1709); Reineccius (Leip. 1730); Parsons & Holmes (Oxford, 1798-1827); Tischendorf (1850), and Swete (1891). Following the Codex Alexandrinus is the edition of Grabe (Oxford, 1707-20, completed by F. Lee), reprinted by Breitinger (Zürich, 1730-32) and others. The Alexandrine Codex has been reproduced in fac-simile by H. H. Baber; the Sinaitic in the same manner by Tischendorf. The literature of the LXX. is very large, and special grammars and dictionaries have been compiled for its peculiarly corrupt idiom. The first part of a Concordance to the Septuagint, by Hatch and Redpath, appeared in 1891.

SEPULCHRAL MOUND. The practice of rearing mounds of earth and stone over the resting-place of the dead may be traced to remote antiquity. It had doubtless its origin in the heap of earth displaced by interment which, in the case of the illustrious warrior or chief, it became the practice to raise into the size and form of the barrow or tumulus which is found all over northern Europe, from Great Britain and Ireland to Upsala in Sweden and the steppes of Ukraine. Sepulchral mounds of some sort seem, indeed, to have been erected among all the nations of Asia as well as of Europe, and they are found in numbers in Central America. Some of the larger tumuli or moathills are but partially artificial, natural mounds having been added to or shaped into the form which it was wished that they should take. There is considerable diversity in the form of the tumuli, the different forms corresponding to different periods considerably remote from each other. The oldest are long-shaped, and in the form of gigantic graves, often depressed in the center and elevated toward one end. Inside the tumulus the body was laid at full length, often along with spear and arrow heads of flint and bone. The bell and bowl-shaped tumuli seem to have succeeded this early form. Within them is often found a short cist and primitive cinerary urn, showing that the body had been burned; but there appears also to be evidence that the processes of inhumation and cremation had been in use contemporaneously, or sometimes the body was placed within the cist in a sitting posture. Skeletons of dogs and horses are occasionally found beside the ashes of the deceased. The sepulchral mounds which seem to be of latest date are broad and low, surrounded sometimes by an earthen vallum, and sometimes, particularly in Scotland and Scandinavia, by a circle of standing stones. In both the inclosed and encircled tumuli, weapons have been found belonging to the period when the metallurgic arts were practiced, and in some instances Roman as well as native relics. A remarkable form of tumulus frequent in Sweden, and occasionally seen in Scotland, consists of an oblong mound larger than the primitive barrow, and terminated at both ends in a point, whence it has been called the *skibs ælunger*, or ship-barrow. Scandinavian antiquaries have come to the conclusion that the bodies of the warriors of the deep were sometimes burned in their ships, whose form was repeated in the earthwork reared above their ashes.

The most numerous class of sepulchral mounds in Scotland are the *cairns* (q.v.) or tumuli of stone, which abound in every district of the country, and were often of much larger dimensions than the earthen tumuli. Another species of monument is the *cromlech* (q.v.).

SEPULVEDA, JUAN GINEZ DE, a Spanish historian, surnamed the Livy of Spain, was b. at Pozo-blanco, in the neighborhood of Cordova, about 1490; studied first at Cordova and Alcala, and went to Bologna in 1515, where he obtained the acquaintance and esteem of the most celebrated savans of Italy and Spain. There he wrote the life of cardinal Albornoz, which was published in 1521. He assisted cardinal Cajetan at Naples in revising the Greek text of the New Testament, and in 1536 returned to Spain as chaplain and historiographer to Charles V., and preceptor to his son, afterwards Philip II. Died in 1573 or 1574. Erasmus speaks of Sepulveda in the *Ciceronianus* in terms of high encomium, and there is indeed little doubt that he was one of the most learned men and best writers of his time. His works comprise Latin translations of part of Aristotle (1531), and of the commentary of Alexander Aphrodisiensis (1527); miscellaneous dissertations, among which were treatises on fate and free-will, in opposition to Luther (1526), in favor of a war with the Turks (1529), in defense of Alberto Pio Cardi-

nal Carpi (1531), on marriage (1531), and in support of the congruency of the military profession with Christianity (1541), on monarchy and the duty of kings (1571). His histories of the reign of Charles V., of that of Philip II., and of the conquests of the Spaniards in Mexico, all of them written in Latin, are still inedited. His other works were collected and published by the royal academy of history at Madrid in 1780 (4 vols. fol.), accompanied with a portrait of Sepulveda, and an account of his life and writings.

SEQUATCHIE, a co. in s. Tennessee, drained by the Sequatchie river, a branch of the Tennessee, flowing through it centrally, 252 sq.m.; pop. '90, 3027, chiefly of American birth, with colored. Its surface is mountainous in the n. and s. where part of the elevated country belongs to the Cumberland, and part to Walden's ridge. The hills are largely covered with forests of oak and hickory. On the river bottoms are groves of beech, maple, and cottonwood. Its soil is moderately fertile, producing grain and tobacco in the arable portions, and is well adapted to stock-raising. Wool is exported. Its mineral products comprise limestone, iron, and coal. Co. seat, Dunlap.

SEQUENTIA (Eng. Sequence or Prose), a hymn of unusual character sung at high mass in certain festivals of the Roman Catholic church. It is the continuation of the series of verses and antiphons interposed between the epistle and the gospel. The missal revised by the council of Trent contains 5 sequences, among them the "Dies Iræ" and "Stabat Mater."

SEQUESTRATION, the Scotch legal term for bankruptcy. See **INSOLVENCY**. In English law sequestration denotes the process by which the creditor of a clergyman of the church of England in possession of a living sues out execution on his judgment, and obtains payment of the debt. In ordinary cases of lay debtors, the sheriff takes possession of the real estate of judgment debtors; but when the debtor is a clergyman, the bishop puts in force the law, and appoints sequestrators to take possession of the benefice, and draw the emoluments, and pay them over to the creditor, first making due provision for the proper celebration of divine worship.

SEQUIN (Ital. *zecchino*, from *zecca*, the name of the Venetian mint), a gold coin, first struck at Venice about the end of the 13th c., was about the size of a ducat (q.v.), and equivalent to about \$2.33 American. Coins of the same name, but varying in value, were issued by other states.

SEQUOIA, a genus of coniferous trees of the cypress family, comprising two species, the *sequoia sempervirens*, or redwood, of the Coast ranges of California, and the *S. gigantea*, the big tree, or big redwood, growing upon the western side of the Sierra Nevada. See **REDWOOD** and **CALIFORNIA**; see *illus.*, **TREES, ETC.**, vol. XIV.

SERAGLIO (properly, **SERAY**) is the palace of the sultan at Constantinople. It stands in a beautiful situation on a head of land projecting into the sea, known as the Golden Horn, and is inclosed by walls $7\frac{1}{2}$ m. in circuit. Within the walls are a variety of mosques, gardens, and large edifices, capable of containing 20,000 persons, though the whole number of the inhabitants scarcely ever reaches the half of this. The principal entrance (*Babi humayun*, or Sublime gate) is a kind of pavilion, which is constantly guarded by *capidjis*, or officers of the seraglio; and the chief of the large edifices within is the *harem* (Arab. sacred spot), which is distinctly separated from the rest of the seraglio, and consists of a group of houses and gardens, one of each being possessed by each of the sultan's wives, and of the habitations of the concubines and slaves. The harem is ruled by the *kiaja-khatun*, or inspector of the women, who is under the sultan's authority alone, and is supplied with what they require by the *kislar-aga*, or chief of the black eunuchs who form the principal or inner guard of the harem. The second and outer guard is given to the white eunuchs, under their chief the *kapu-agassy*, or *kapu-oghlan*. Other classes of household officers are the *mutes* (Turkish, *bisclân* or *diissis*), who, till recently, were the executors of the sultan's orders, especially those in which the utmost secrecy was required; the *bostanjis*, or gardeners; the *baltajis*, or cleavers of wood; and the *itsh-oghlanis*, or attendants of the sultan. The sultan's mother always resides within the seraglio, but his sisters do not. Access may easily be had to the seraglio, with the exception of the harem, which is scrupulously guarded from even the eyes of strangers. The two terms "seraglio" and "harem" are often confounded.

SERAING, a t. of Belgium, in the province of Liège, and between three and four m. s.w. from Liège, on the right bank of the Meuse. It is a station on the railway between Namur and Liège, and is connected by a handsome suspension-bridge with the village of Jemeppe, on the left bank of the Meuse. Seraing is a place of great activity, and contains a manufactory of steam-machinery, locomotives, etc., which is probably the largest in the world. This manufactory was established by an Englishman, John Cockerill, in 1817; the king of Holland, to whose dominion Belgium then belonged, joining him in the enterprise. The town depends on these works for its prosperity. Pop. '93, 35,278.

SERAJO. See **BOSNA-SERAI**.

SERAMPORE, a neat t. of British India, built in the European style, and extending a mile along the right bank of the Hooghly, 13 m. n. of Calcutta. It has a college and library. Serampore was at one time a Danish settlement, but was transferred by purchase to the British in 1845. Pop. '81, 25,559.

SERANG. See CERAM.

SERAO, MATILDE, one of the most prominent of contemporary Italian novelists, born at Patras, Greece, in 1856. She first wrote short sketches for the Neapolitan papers, and was for a time connected with the editorial staff of the *Capitan Fracassa*. Later, in conjunction with her husband, Edvardo Scarfoglio, she founded the *Corriere di Roma* (afterwards *Corriere di Napoli*), and in 1891 founded the *Mattino*. As a novelist she shows in her earlier work unmistakably the influence of the French realists, notably Zola, whose *Ventre de Paris* she has followed in spirit as well as title in her *Ventre di Napoli*. In her later novels she has devoted herself to psychological problems, which she handles with much subtlety and power. Among her best works are, *Conquista di Roma*; *Vita e Avventure di Riccardo Joanna*; *Il Paese di Cuccagna*, *Addio Amore*; *Gli Amanti*; *Le Amanti*.

SERAPEUM (Gr. *serapeion* or *sarapeion*), a temple so named in honor of Serapis (q. v.), several of which are known to have existed in the ancient world. The most remarkable of these temples was that of Alexandria, which was situated s. of the canal, and outside the walls of the city, and superseded an older temple at Rhacotis. Hither was transported the statue of Dis or Plato from Sinope by Ptolemy I., and attached to it was the celebrated Alexandrian library (q. v.). The serapeum at Memphis attained scarcely less reputation, and consisted of a group of temples dedicated to Astarte, Anubis, Imouthos or Æsculapius, and Serapis. It was approached from the city of Memphis by an avenue of sphinxes, which had already become partially buried in the sands in the days of Strabo, and were discovered by M. Mariette in 1850, who, after a series of excavations, uncovered the ruins, and discovered the cemeteries of the mummied apis or bulls sacred to Ptah and Osiris at Memphis. Close to the serapeum was the apeum, or temple of the living apis, in which the bull lived, as well as the cow which had produced him. The serapeum, or, as it was called in Egyptian, the abode of *Osor-hapi*, or the Osiris-Apis, was, in fact, the sepulcher of the bull. The most remarkable part of the work, which was of great extent, was the subterranean tombs of the mummies of the apis, consisting of galleries with numerous chambers, in which the remains of these bulls had been deposited from the reign of Amenophis III. of the 18th dynasty, about 1400 B.C., till the time of the Romans. Two principal galleries contained the tombs. The second gallery, commenced in the 53d year of Psammetichus I., was on a grander scale than the first, with larger sepulchral chambers and magnificent sarcophagi of granite, measuring sometimes 12 ft. high, 15 ft. long, and weighing many tons. During the reign of the Persians, and subsequently, the chambers decreased in size, and the monuments exhibit the general decadence of the arts. The apis, considered as the incarnation of the god Ptah during life, received royal and divine honors after death; his body, or the principal portion, being embalmed, and a sepulchral tablet or tombstone placed on his sepulcher, along with other tablets of different worshippers, who adored his divinity, and dedicated them to the deceased bull. As the principal tombstone of the bull contained the dates of the king's reign in which he was born or discovered, enthroned in the apeum, and died or was buried in the serapeum, these tablets have become an important element for the chronology of the 19th and subsequent dynasties, and have aided to fix some of the hitherto doubtful points of the chronology of the period. They terminate with Ptolemy Euergetes II., 177 B.C. The tablets, votive and sepulchral, amounted to about 1200, and the most remarkable are at present in the museum of the Louvre at Paris. Numerous bronze figures and other antiquities were found during the excavations, comprising costly objects of jewelry, many of which are also in the Louvre. Besides these, several Greek papyri which appear to have formerly belonged to the library or archives of the serapeum were previously known, and many have been published. These throw great light upon the constitution of the hierarchy of the serapeum, among which was a kind of order of monks, who lived within the precincts of the building, beyond which they did not go, and subsisted upon alms or the contributions of their family.—Mariette, *Serapeum de Memphis* (4to, Paris, 1856); *La Mère d'Apis* (4to, Paris, 1856); *Athen. Fran.* (4to, Paris, 1855-56); Lepsius, *Ueber den Apis-kreis*, *Zeitsch. d. Morg. Gesell.* (8vo, Leip. 1853).

SERAPHIM (plural of *seraph*), celestial beings in attendance on Jehovah, mentioned by Isaiah. They are similar to the cherubim (see Cherub), have the human form—face, voice, two hands, and two feet—but six wings, with four of which they cover their face and feet—as a sign of reverence—while with two they fly. Nothing is more uncertain than the origin of this conception, or of the word which expresses it. Their office of singing the praises of Jehovah's greatness, and of being the swift messengers between heaven and earth, does not go far to explain it. A comparison has been made between the seraphim and the winged men and beasts on the Judean, Assyrian, and Babylonian monuments.

SERAPIS, or SARAPIS, the Greek name of an Egyptian deity, introduced into Egypt in the time of Ptolemy I., or Soter. This monarch is said to have seen the image of a god in a dream, commanding him to remove it from the place where it was; and Sosibius, a traveler, having recognized it as existing at Sinope, Soteles and Dionysius were sent from Egypt, and brought it from Sinope to Alexandria. On its arrival it was examined

by Timotheus the interpreter and the celebrated Manetho, who called it Serapis, and appear to have identified it with Osorhapis, or Osiris united with Apis, i. e., Osiris, in his character of the Egyptian Pluto, as a deity of similar character. The figure, in fact, appears to have been one of Hades or Pluto, having at its side Cerberus, and a dragon or snake. According to some authorities, the statue of Serapis was sent to Ptolemy II., or Philadelphus, because that monarch had relieved the city of Sinope from famine by supplying it with corn, and the statue was placed in the Serapeum, at the promontory of Rhacotis. The Serapis of the Ptolemaic period, however, was not an Egyptian, but a Greek deity, whose temple was not admitted into the precincts of Egyptian cities, and only found favor in the Greek cities founded in Egypt. It is said that 42 temples were erected under the Ptolemies and Romans to this god in Egypt. His resemblance to Osiris consisted in his chthonic or infernal character, as judge of the dead and ruler of Hades. About his nature and attributes the Greeks themselves entertained very different ideas, some considering him allied to the sun, others to Æsculapius or Hades. The god had a magnificent temple at Alexandria, to which was attached the celebrated library; another at Memphis, in the vicinity of the cemetery of the mummies of the Apis, which has been recently excavated by M. Mariette; and another temple at Canopus. From recent discoveries, it appears that he represented or was identified with the Hesiri Api, or Osorapis, the "Osirified" or "dead Apis," who was also invested with many of the attributes of Osiris, and considered, while living, to be the incarnation of the god Ptah-Socharis-Osiris, the tutelary divinity of Memphis. The worship of Serapis, introduced into Egypt by the Ptolemies, subsequently became greatly extended in Asia Minor; and his image, in alliance with that of Isis and other deities, appears on many of the coins of the imperial days of Rome. In 146 A.D. the worship of the god was introduced into the city of Rome by Antoninus Pius, and the mysteries celebrated on May 6; but they were not long after abolished by the senate, on account of their licentious character. A celebrated temple of Serapis also existed at Puteoli (Pozzuoli), near Naples, and the remains of it are still seen, and present curious geological phenomena. In Egypt itself the worship of the deity subsisted till the fall of paganism, the image at Alexandria continuing to be worshiped till destroyed, 398 A.D., by Theophilus, archbishop of that town. Busts of Serapis are found in most museums, and his head or figure engraved on certain stones was supposed to possess particular mystic virtues. His temples were oracular, the votaries consulting him by sleeping and dreaming in them; and at Alexandria the priests connected his worship with the healing art.—Plutarch, *De Isid.* s. 28; Clemens, *Orat. Adhort.* p. 21; Tacit. *Hist.* iv. c. 83, 84; Strabo, Lib. xvii. p. 552; Macrobius, *Saturn.* i. 7, 25; Nixon, *Dell' Edificio di Pozzuoli detto il Tempio di Serapide* (Nap. 1773); Wilkinson, *Mann. and Cust.* iv. p. 360; Gibbon, *Decline and Fall*, c. 28.

SERASKIER, or **SERI-ASKER** (Pers. head of the army), the name given by the Turks to every gen. having the command of a separate army, and, in particular, to the commander-in-chief or minister of war. The seraskier, in the latter sense, possesses most extensive authority, being subordinate only to the sultan and grand vizier; he is selected by the monarch from among the pashas of two or three tails.

SERENADE (Ital. *serenata*), originally music performed in a calm night; hence an entertainment of music given by a lover to his mistress under her window. Serenading has been chiefly practiced in Spain and Italy. It is common among the students of the German universities to assemble at night under the window of a favorite professor, and give him a musical tribute.—A piece of music characterized by the soft repose which is supposed to be in harmony with the stillness of night, is called a serenade, or sometimes a *notturno*.

SERES, a t. in s. European Turkey, in the vilayet of Salonica, department of Macedonia, 43 m. n.e. of the city of Salonica; pop. 30,000. The cultivation of the silkworm was commenced here by Justinian. It is protected by high walls, and contains a citadel, many handsome villas, fountains, several mosques and churches. It exports skins, cotton, wool, and tobacco. It has manufactories of cotton and woolen goods.

SERETH, an important affluent of the Danube, rises in the Austrian crownland of Galicia, runs southward through almost the whole length of Moldavia, and joins the Danube 5 m. above Galatz, after a course of 290 miles.

SERF (Lat. *servus*, a slave). A numerous class of the population of Europe known as serfs or villeins were in a state of slavery during the early middle ages. In some cases this serf population consisted of an earlier race, who had been subjugated by the conquerors; but there were also instances of persons from famine or other pressing cause selling themselves into slavery, or even surrendering themselves to churches and monasteries for the sake of the benefits to be derived from the prayers of their masters. Different as was the condition of the serf in different countries and at different periods, his position was on the whole much more favorable than that of the slave under the Roman law. He had certain acknowledged rights—and this was more particularly the case with the classes of serfs who were attached to the soil. In England, prior to the Norman conquest, a large proportion of the population were in a servile position, either as domestic slaves or as cultivators of the land. The name of *nativus*, generally applied to

the serfs, seems to indicate that they belonged to the native race, the earliest possessors of the soil. The powers of the master over his serf were very extensive, their principal limitations being, that a master who killed his serf was bound to pay a fine to the king, and that a serf deprived of his eye or tooth by his master was entitled to his liberty. The Norman conquest made little change in the position of the serf. The lowest class of serfs were the *villeins in gross*, who were employed in menial household services, and were the personal property of their lords, who might sell them or export them to foreign countries; while the most numerous class, who were employed in agriculture, and attached to the soil, were called *villeins regardant*. These latter, though in some respects in a better position than the villeins in gross, might be severed from the land, and conveyed apart from it by their lord. They were incapable of enjoying anything like a complete right to property, inasmuch as it was held, in accordance with the principles of the Roman law, that whatever the slave acquired was his *peculium*, which belonged to his lord, who might seize it at his pleasure. By a peculiarity in the usages of Britain, the condition of a child as regards freedom or servitude followed the father, and not the mother, and therefore the bastards of female villeins might be free. In France and Germany, besides the classes of serf alluded to, there were others whose servitude was of a milder description, and who were only bound to fixed duties and payments in respect of their lands.

The abolition of serfdom in western Europe was a very gradual process, various causes having combined to bring it about. The church both inveighed against the practice of keeping Christians in bondage, and practiced manumission to a large extent. In the course of time, usage greatly modified the rights and liabilities of the serf, whose position must have been considerably altered when we find him making stipulations regarding the amount of his services, and purchasing his own redemption. The towns afforded in more than one way a means of emancipation. A serf residing a year in a borough without challenge on the part of his lord, became *ipso facto* a free man; and the result of experience showed that the industry of the free laborer was quite as productive as that of the serf. At all events, serfdom died out in England without any special enactment; yet it was not wholly extinct in the latter half of the 16th c., for we find a commission issued in 1574 by queen Elizabeth, to inquire into the lands and goods of all her bondsmen and bondswomen in the counties of Cornwall, Devon, Somerset, and Gloucester, in order to compound with them for their manumission, that they might enjoy all their lands and goods as freedmen. In a few rare instances, liability to servile duties and payments in respect of lands seem to have continued down to the reign of Charles I. In Scotland, as in England, serfdom disappeared by insensible degrees; but a remarkable form of it continued to survive down to the closing years of last century. Colliers and salters were bound by the law, independent of paction, on entering to a coal-work or salt-mine, to perpetual service there; and in case of sale or alienation of the ground on which the works were situated, the right to their services passed without any express grant to the purchaser. The sons of the collier and salter could follow no occupation but that of their father, and were not at liberty to seek for employment anywhere else than in the mines to which they had been attached by birth. Statutes 15 Geo. III. c. 28 and 39 Geo. III. c. 56, restored these classes of workmen to the rights of freemen and citizens, and abolished the last remnant of slavery in the British islands.

In France, though a general edict of Louis X., in 1315, purported to enfranchise the serfs on the royal domain on payment of a composition, this measure seems never to have been carried into effect, and a limited sort of villeinage continued to exist in some places down to the revolution. In some estates in Champagne and Nivernais, the villeins, known as *gens de main morte*, were not allowed to leave their habitations, and might have been followed by their lords into any part of France for the *taille* or villein-tax. In Italy, one great cause of the decline of villeinage was the necessity under which the cities and petty states found themselves to employ the peasant population for their defense, whom it became expedient to reward with enfranchisement. In the 11th and 12th centuries the number of serfs began to decrease, and villeinage seems no longer to have had an existence in Italy in the 15th century. Over a large portion of Germany the mass of the peasants had acquired their freedom before the end of the 13th c., but in some parts of the Prussian dominions a modified villeinage continued to exist until swept away by the reforms of Von Stein in the present century.

In Russia, where the feudal system never prevailed, the early condition of the peasant was not a servile one. Down to the 11th c. he could occupy any portion of the soil that he had the means of cultivating, the land being the property of all, and farmed on the purest communistic principles. The reduction of the peasantry to a state of serfdom, and their attachment to the soil, was gradually effected, and not completed till the close of the 16th century. The Russian peasant of the 19th c. was in some respects in as servile a condition as the feudal villein of the 12th c. in the w. of Europe; but there was this peculiarity attaching to his position, that while he himself was the property of his lord, the land which he cultivated belonged to himself—a consideration which greatly complicated the question of his emancipation. The emperor Alexander I. introduced various improvements in the condition of the peasantry, particularly those belonging to the crown, and in his reign serfdom was abolished in Cour-

land and Livonia. The entire abolition of villeinage has been effected by the present emperor, Alexander II., by a very sweeping measure. From March, 1863, the peasants, both husbandmen and domestics, have been made entirely free as regards their persons, while they have also obtained the perpetual usufruct of their cottages and gardens, and certain portions of land.—See, on the subject of serfdom generally, Hallam's *State of Europe During the Middle Ages*, chap. 2.

SERGE, a kind of twilled worsted cloth of inferior quality. There is also a coarse kind of twilled silk used for lining gentlemen's coats called silk serge.

SERGEANT, JOHN, 1710-49; b. N. J.; graduated at Yale college 1729; tutor there 1732-35; ordained a Congregational minister at Deerfield, Mass., in 1735, and preached among the Indians at Skatekook and Unahktukook on the Housatonic river. He translated into the Indian language parts of the Old Testament and all of the New except Revelation. Through his labors 129 Indians were baptized.

SERGEANT, JOHN, LL.D.; 1779-1852; b. Philadelphia; graduated at Princeton college in 1795; admitted to the bar in 1801; was deputy attorney-general of Pennsylvania; counsel in many important cases in the state and U. S. supreme courts; several times member of the legislature; a member of congress for six terms between 1815 and 1842; president of the state constitutional convention in 1830; whig candidate for vice-president with Henry Clay in 1832. He took strong ground against the extension of slavery, and exerted great personal influence in the community.

SERGEANT, JONATHAN DICKINSON, 1746-93; b. N. J.; graduated at Princeton college in 1762; studied law; was a member of the continental congress 1776-77, taking his seat soon after the declaration of independence; was attorney-general of the state in 1777, which position resigning in 1780, he devoted himself to his profession in Philadelphia, in which he took high rank. He fell a victim to the yellow fever during his benevolent exertions as a member of the board of health.

SERGEANT-AT-ARMS, in the English court of chancery, is the officer who attends upon the lord chancellor with the mace, and who executes by himself or deputies various writs of process directed to him in the course of a chancery suit, such as apprehending parties who are pronounced to be in contempt of the court. A similar officer attends on each house of parliament, and arrests any person ordered by the house to be arrested.

In the United States senate the sergeant-at-arms is legally authorized to preserve order; and, under the direction of the president of the senate, to expel from the senate-chamber; to arrest and bring before the bar of the senate; to serve processes; and to keep in custody those persons whom he may arrest under the authority of the senate. The pay of the office includes an annual salary of \$2,000, and fees for specially designated services. The duties of the sergeant-at-arms of the house of representatives are of a similar nature to those just described. In addition, he has charge of the accounts of the house with the members, disburses money, etc. His salary is \$4,320, and he has no fees.

SERGEANT-AT-LAW used to be the highest degree of barrister in the common law of England, and was called sergeant-counter, or of the coif. The degree is of great antiquity, and formerly a barrister could only be appointed after being of sixteen years' standing, but now no particular qualification as to time is required. Formerly, also, they had exclusive audience in the court of common pleas, but that monopoly has been abolished. The proper forensic dress of a sergeant is a violet-colored robe with a scarlet hood. A sergeant is appointed by a writ or patent of the crown. The chief-justice of the common pleas recommends the barrister to the lord chancellor, who advises the crown to make the appointment. The degree of sergeant is entirely honorary, and merely gives precedence over barristers; and when he is appointed, he is rung out of the inn of court to which he belongs, and thereafter joins the brotherhood of sergeants, who form a separate community. By ancient custom, the common-law judges were always admitted to the order of sergeants before sitting as judges, but this practice was abolished in 1874. A queen's counsel (q.v.) takes precedence of all sergeants, unless these have patents of precedence, which prevent them being displaced by the queen's counsel who come after them. Sometimes one or more of the sergeants are appointed queen's sergeants.

SERGEANTS (Fr. from Lat. *serviens*, serving) are non-commissioned officers of the army and marines in the grade next above corporal. They are selected from the steadiest among the corporals, and their duties are to overlook the soldiers in barracks, and to assist the officers in all ways in the field. They also command small bodies of men as guards, escorts, etc. Every company has four sergeants, of whom the senior is the color-sergeant. A superior class are the staff-sergeants, as the quartermaster-sergeant, armorer-sergeant, hospital-sergeant; and above them all is the sergeant-major. The monthly pay of a sergeant in the United States army is fixed at seventeen dollars per month. For his privileges, see **NON-COMMISSIONED OFFICERS**. In ancient times the rank of sergeant was considerably more exalted. In the 12th c. the sergeants were gentlemen of less than knightly rank, serving on horseback. Later, the sergeants-at-arms were the royal body-guard of gentlemen armed *cap-à-pià*.

SERGEANTRY, GRAND (Fr. *sergenterie*, from Lat. *serviens*), a tenure by which lands were held in feudal times in England. After the conquest the forfeited lands were parceled out by William to his adherents on condition of the performance of services of a military character. The military tenants of the crown were, however, of two descriptions: some held merely *per servicium militare*, by knight-service; others held *per sergentiam*, by grand sergeantry, a higher tenure, which involved attendance on the king not merely in war, but in his court at the three festivals of the year, and at other times when summoned. Although the word baron, in its more extended sense, was applied to both classes of crown tenants, yet it was only those holding by grand sergeantry whose tenure was said to be *per baroniam*. In its earliest stage the distinction between the greater nobility and lesser nobility or gentry in England was, that the former held by grand sergeantry, and the latter by knight service only. In theory, lands held by sergeantry could not be alienated or divided; but practically this came to be often done, and by this means tenures by sergeantry became gradually extinct before the abolition of military holdings. Considerable misapprehension on the part of Dugdale and later writers has arisen from a double use of the word *serviens*, or sergeant, which is sometimes applied to a tenant either by grand sergeantry or knight-service who had not taken on himself the obligations attendant on knighthood.

The term petty sergeantry was applied to a species of socage tenure in which the services stipulated for bore some relation to war, but were not required to be executed personally by the tenant, or to be performed to the person of the king, as the payment of rent in spurs or arrows.

SERGIPE, a maritime province of Brazil, bounded on the n. by the Sao Francisco, which separates it from Alagoas; on the w. and s. by Bahia; and on the e. by the Atlantic. According to the most recent statements, this province is the smallest in the empire. Area, 7370 sq. m.; pop. '94, 264,991 (est.). The shores are low and sandy, the interior mountainous. The e. part is fertile, well wooded, and produces sugar and tobacco; the western districts are devoted principally to the rearing of cattle. Very good timber is obtainable; and gold and iron are found. The capital is Aracajú, a small town on the coast.

SERIATIM (Lat.) signifies "in a series," "one by one." This term is frequently used in legal documents with reference to the announcement of the opinions of judges; as, "the judges delivered their decisions *seriatim*."

SERIES, CHEMICAL. See **HOMOLOGY** and **BOILING OF LIQUIDS**.

SERIES, MATHEMATICAL. See **ARITHMETICAL PROGRESSION**, **GEOMETRICAL PROGRESSION**, and **PROGRESSION**.

SERINAGUR, SRINAGAR, or CASHMERE, the capital of the valley of Cashmere, stands on both sides of the Jhelum, which is here 100 yds. wide, 170 m. n.n.e. of Lahore. It is quaint and picturesque-looking almost beyond conception. The streets, or rather narrow lanes, lead to the river, and the houses, five and six stories high, are built of wood. Not a single straight line is to be seen. The houses overhang the river, and lean toward each other above the lanes in various stages of dilapidation. Communication between the two quarters is kept up by means of a number of rustic wooden bridges, built on enormous piles of timber. Shawls are an important article of manufacture (see **CASHMERE**). The manufacture of articles of papier-mâché, the designs of which are far in advance of the workmanship, and engraving on stone and metal, are also important branches of industry. The vicinity of the city, with its border of towering mountains, is exceedingly beautiful. The numerous lakes, connected with the town and river by canals, recall Venice to the traveler. The most notable public structures are the Jumna Musjid or "Great Mosque," the mosque of Shah Hamedan, a royal tomb, and the Maharajah's residence. Near the e. end of the city lies the dal or lake of Serinagur, about 5 m. long, and $2\frac{1}{2}$ broad. It is a lovely and tranquil sheet of water, was formerly a choice retreat of the Mogul emperors, the remains of whose pleasure-grounds and palaces are still visible on its margin. Pop. '91, 118,460.

SERINGAPATAM (properly, *Shri Ranga Patanam*, city of Vishnu), a decayed city of southern India, built on an island in the channel of the Kaveri, 8 m. n.n.e. of Maisur. The island, three m. long, and one m. broad, has a wretched appearance, and the town itself is ill-built, ill-ventilated, and ugly. The fort, about three-quarters of a m. broad, is surrounded by walls of stone, and contains the ruins of the palace of Tippoo Sahib (q.v.). In the days of its highest prosperity, Seringapatam is said to have contained 300,000 inhabitants; in 1800 it contained 31,895, and in '91 it contained 12,551. Hyder Ali (q.v.) made it the seat of his government in 1765. It was besieged by Lord Cornwallis in 1791, and again in 1792. On the last occasion, the terms dictated by the commander of the British to Tippoo, the son and successor of Hyder Ali, were very severe. A British army appeared before the walls again in 1799; and on May 3 of that year the fort was stormed, and Tippoo slain in the vicinity of his own palace.

SERMONETA, MICHELANGELO CAETANI, Duke of; b. Italy, 1804, of a noble and ancient family. He early showed great talent as an artist, and as a literary man. He was an earnest student of Dante, and published several essays on the *Divina Commedia*, as well as a series of illustrations, of originality and delicacy of execution. In 1865

Sermonéta became blind. In 1870 he was president of the commission which announced to Victor Emmanuel the result of the Roman *plébiscite*. He died 1882.

SEROUS FLUIDS. This term is applied by chemists and physicians to various fluids occurring in the animal body. They are arranged by Gorup-Besanez, one of the highest authorities on physiological chemistry, under three heads: 1. Those which are contained in the serous sacs of the body, as the cerebro-spinal fluid, the pericardial fluid, the peritoneal fluid, the pleural fluid, the fluid of the tunica vaginalis testis, and the synovial fluid. 2. The tears and the fluids existing in the eyeball, the amniotic fluid, and transudations into the tissue of organs. 3. Morbid or excessive transudations, such as dropsical fluids, the fluids occurring in hydatids, and in blebs and vesicles on the skin, and transudations from the blood in the intestinal capillaries, as in cases of intestinal catarrh, cholera, or dysentery.

All these fluids bear a close resemblance to one another, both in their physical and chemical characters. In so far as relates to their physical characters they are usually clear and transparent, colorless or slightly yellow, of a slight saline, mawkish taste, and exhibiting an alkaline reaction with test-paper. They possess no special formal or histological elements, but on a microscopic examination blood-corpuscles, cells of various kinds, molecular granules, and epithelium may occasionally be observed in them. The ordinary chemical constituents of these fluids are water, fibrine (occasionally), albumen, the fats, animal soaps, cholesterine, extractive matters, urea (occasionally), the same inorganic salts which are found in the serum of the blood, and the same gases as occur in the blood. As rare constituents, and only occurring in disease, may be mentioned sugar, the biliary acids, salts of lactic and succinic acids, creatinine, mucine, etc. The following analysis of four of these fluids will serve to give a good idea of their composition:

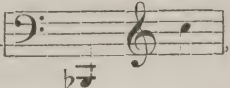
	Plasma of the Blood.	Peritoneal Dropsy.	Hydro- thorax.	Dysenteric Transudation.
Water.....	901.51	946.0	936.0	958.6
Solid Constituents.....	98.49	54.0	64.0	41.4
Fibrine.....	8.06	....	0.6	....
Albumen.....	.....	33.0	52.8	15.0
Extractive Matters.....	81.92	13.0	3.0	14.6
Inorganic Salts.....	8.51	8.0	7.4	11.8


SEROUS MEMBRANES. There are seven of these membranes in the human body, three being median and single, while two are double and lateral. They are the arachnoid, the pericardium, and the peritoneum, with the two pleuræ and tunicæ vaginales testis. Thus they are connected, with the obvious view of facilitating motion and affording general protection, with all the most important organs in the body. They are all closed sacs, with one exception, and a reference to the articles PERICARDIUM, PERITONEUM, and PLEURÆ, will at once show the reader that each sac or continuous membrane consists of two portions—a parietal one, which lines the walls of the cavity, and a visceral, or reflected one, which forms an almost complete coating or investment for the viscera contained in the cavity. The interior of the sac is filled during life with a halitus or vapor, which after death condenses into a serous fluid. With regard to their structure it is sufficient to state that they consist essentially of (1) epithelium; (2) basement membrane; (3) a stratum of areolar or cellular tissue, which constitutes the chief thickness of the membrane, and is the constituent on which its physical properties are mainly dependent. This layer is more liable to variation than the others, and one of the most common alterations is an augmentation of the yellow fibrous element, by which an increased elasticity is given to the membrane, which is thus better adapted for distention, and for a subsequent return to its original bulk. The situations in which this augmentation is found are, as Dr. Brinton (*Cyclopædia of Anatomy and Physiology*, vol. iv. p. 524) has pointed out, in exact conformity with this view: in the peritoneum, which lines the anterior abdominal wall, and covers the bladder, it attains its maximum; in the detached folds of the mesentery, in the costal pleuræ, and in the suspensory ligament of the liver it is still very prominent; while on the posterior wall of the belly, and in serous membranes covering the heart, liver, etc., it is almost absent.

The following are the most important of the morbid changes to which these membranes are liable. One of the most frequent of the morbid appearances seen in these structures is the presence of an excess of serous fluid in their cavity. This condition occurs in deaths from various diseases, and in general the serous membrane only shares in a dropsy which is common to other structures, and especially affects the areolar or cellular tissue. When general anasarca, or dropsy of the cellular tissue, has existed for a long time, more or less dropsical effusion is usually found in the pleuræ and peritoneum. The inflammation of these structures is sufficiently described in the articles PERICARDITIS, PERITONITIS, and PLEURISY. Tubercle is seldom primarily deposited in these membranes, although it is not uncommon after other organs have been implicated. Cancer and ossification of the serous membranes are rare affections, but cysts of various kinds, some of which are of parasitic origin, are often found.

Synovial membranes present many points of similarity to serous membranes; as, however, they also present several points of difference, they will be briefly noticed in a special article.

SERPENT, a powerful bass musical wind instrument, consisting of a tube of wood covered with leather, furnished with a mouth-piece like a trombone, ventages, and keys, and twisted into a serpentine form, whence its name. Its compass is said to be from B₂ below the bass staff to C in the third space of the treble clef, including every tone and

semitone— but the highest octave does not sound well with ordinary players. When unskillfully played, it exhibits the most startling inequalities of

tone, in consequence of there being three notes  much more power-

ful than the rest. The serpent is in B₂, and therefore music for it must be written a whole tone above the real sounds. The serpent was invented by a French priest at Auxerre in 1590, and while its principal use has been in military music, it has also been employed in the orchestra to re-enforce the basses. As an orchestral, and even as a military instrument, the serpent is far less manageable than the ophicleide (q.v.), which has nearly superseded it. It is still much used in the music of the Roman Catholic church.

SERPENTARIA. See **ARISTOLOCHIA.**

SERPENT-CHARMING, an art which has been practiced in Egypt and throughout the east from remote antiquity, and which forms the profession of persons who employ it for their own gain, and for the amusement of others. In India, and partly if not entirely in other countries, this profession is hereditary.

There are several allusions to serpent-charming in the Old Testament: see Psalm lviii. 4, 5; Eccles. x. 11; Jer. viii. 17. It is mentioned also by some of the ancient classics, as Pliny and Lucan.

Serpent-charmers usually ascribe their power over serpents to some constitutional peculiarity, and represent themselves as perfectly safe from injury even if bitten by them. To confirm this, they are accustomed, in their exhibitions, to exasperate the serpents, and allow themselves to be bitten, so that blood flows freely. But it has been fully ascertained that the serpents which they carry with them, and produce on these occasions, although of the most venomous kinds, have been at least deprived of their poison-fangs, and to prevent new ones from growing, a portion of the maxillary bone is often if not always taken out; in some cases, it appears that the poison-glands themselves are removed by excision and cautery.

So much, however, being set aside as of the nature of a mere juggler's trick, much still remains which is interesting, and in which there is unquestionable reality. The serpent-charmers of the east have a power beyond other men of knowing when a serpent is concealed anywhere, long practice having probably enabled them to distinguish the musky smell which serpents very generally emit, even when it is too faint to attract the attention of others. They are therefore sometimes employed to remove serpents from gardens and the vicinity of houses. In this, as in their exhibitions, they pretend to use spells. What power the tones of their voice may exert is of course uncertain; but they accompany their words with whistling, and make use also of various musical instruments, the sound of which certainly has great power over serpents. When they issue from their holes, the serpent-charmer fearlessly catches them, by pinning them to the ground by means of a forked stick. But one of the first things he does afterward is to knock out or extract the poison-fangs.

In the exhibitions of serpent-charmers, the creatures are often made to twine round the bodies of the performers. They also erect themselves partially from the ground, and in this posture they perform strange movements to the sound of a pipe, on which the serpent-charmer plays. It appears also that he exerts a very remarkable influence over them by his eye, for even before any musical sound has been employed, he governs and commands them by merely fixing his gaze upon them.

Serpent-charmers have of late years visited Western countries and there given exhibitions similar to those which are common in the East.

SERPENTINE, a mineral composed of silica and magnesia in almost equal proportions, with about 13 to 15 per cent of water, and a little protoxide of iron. Serpentine is generally massive; very rarely crystallized in rectangular prisms. COMMON SERPENTINE sometimes occurs as a rock. It is unctuous to the touch, and soft enough to be scratched by calcareous spar. It is not easily broken, but can be cut without much difficulty. It is generally green, black, or red; the color sometimes uniform, sometimes spotted, clouded, or veined. It receives its name from the serpent-like form which the veins often assume. It is cut and turned into ornaments of various kinds. PRECIOUS

SERPENTINE or **NOBLE SERPENTINE** is of a rich dark-green color, hard enough to receive a good polish, translucent; and sometimes contains imbedded garnets, which form red spots, and much add to its beauty. It is a rare mineral. It occurs at Baireuth in Germany, in Corsica, at Portsoy in Banffshire, in the Shetland islands, etc. It is generally found along with foliated limestone, in beds under gneiss, mica-slate, etc., or in common serpentine. The ancient Romans used it for pillars and for many ornamental purposes; and vases, boxes, etc., are still made of it, and much prized. The ancients ascribed to it imaginary medicinal virtues.

SERPENTINE, THE, is an artificial lake in Hyde Park which takes its name from its general contour. It covers fifty acres and was formed about 1730 by order of Queen Caroline, wife of George II. It is supplied by the Thames. It is much frequented in summer by bathers, while in winter it is much used for skating. Along the northern bank is a delightful drive known as the "Lady's Mile." Along this drive are many grand, old oak-trees, among which are those said to have been planted by Charles II.

SERPENTS, *Ophidia*, an order of reptiles, which is in general simply characterized as having a very elongated body and no external limbs. The links, however, which unite saurians with serpents are very numerous; the limbs of many saurians being partially wanting, and little more than rudimentary; whilst rudimentary limbs are found by anatomical examination in many serpents, and the rudimentary hinder limbs of some, as boas, appear externally in the form of hooks or claws. See **BOA**.

The body and tail are covered with scales, the head often with plates. The vertebrae and ribs are extremely numerous, a pair of ribs being attached to each vertebra throughout the whole length of the body. Some serpents have more than 300 pair of ribs. The ribs not only serve to give form to the body, and aid in respiration, but are also organs of locomotion. There is no breast-bone (*sternum*) for the small end of the ribs to be attached to, as in other vertebrate animals, but each rib is joined by a slender cartilage and a set of short muscles to one of the scales of the abdomen. A serpent moves by means of the ribs and of these scales, which take hold on the surface over which it passes, and in this way it can glide—often very rapidly—along the ground, or on the branches of trees; and many species climb trees with great facility, gliding up them as if on level ground. Most—if not all—of the species are also capable of elevating a great portion of the body from the ground; and many of those which live among the branches of trees hold their place firmly by means even of a few scales near the tail, and freely extend the greater portion of the body in the air. On a perfectly smooth surface, as that of glass, a serpent is quite helpless, and has no power of locomotion.

The vertebrae of serpents are so formed as to admit of great pliancy of the body, which is capable of being coiled up, with the head in the center of the coil, and some serpents have the power of throwing themselves to some distance from this coiled position. The vertebrae are articulated by perfect ball-and-socket joints, the anterior extremity of each being rounded into a smooth and polished ball, which fits exactly into a hemispherical cup in the next; but there are processes in each vertebra which prevent any motion except from side to side, so that serpents are quite incapable of the vertical undulations so often represented in prints. The ribs are also attached to the vertebrae by ball-and-socket joints.

Cuvier divided serpents into three sections, the first—of which the common blind-worm (q.v.) or slow-worm of Britain is an example—consisting of those which have the skull, teeth, and tongue similar to those of saurians, and in which the eye has three lids, and there are vestiges of bones of anterior limbs; the second, which Cuvier calls true serpents, having no vestiges of such bones, the eye destitute of lids, and the bones of the head so formed that the mouth and throat are capable of very great dilation; the third, which he calls naked serpents, containing only the genus *cacilia* (q.v.), now known, notwithstanding its form, to belong really to the batrachians or amphibia.

The serpents of Cuvier's first section have been conjoined with some of the nearly allied saurians, more or less furnished with external limbs, under the name *sauropsidia*, by Mr. Gray. They are connected with the true serpents by the families *amphisbænidæ* and *typhlopsidæ*, which nearly agree with them in the structure of the head and mouth, but want the third eyelid—some of the *typhlopsidæ*, indeed, having the eye itself merely rudimentary—and, like the true serpents, have no vestige of breast-bone or shoulder. These, with all the creatures included in this section, are, in so far as is known, perfectly harmless. They live chiefly on insects and other very small animals.

The true serpents live on larger prey, which they swallow entire, some of them—as the boas—crushing it by constriction in the coil of their muscular body. The prey of a serpent is often thicker than the serpent itself, and to admit of its being swallowed, the throat and body are very dilatable. The bones of the head are adapted to the necessity of a great expansion of the mouth and dilation of the throat. The bones composing the upper jaw are loosely joined together by ligaments; and even the arches of the palate are movable. The two halves of the lower jaw are connected by a ligament, so loose and elastic that they are capable of separation to a great extent; and the mastoid and tympanic bones, which connect the lower jaw and the skull, are lengthened out into pedicels, allowing an extraordinary power of dilation. Serpents, however, sometimes

seize prey too big for them to swallow, and die in the attempt, their teeth being so formed as to render it difficult to reject by the mouth what has once got into the throat.

The teeth of the true serpents are simple, and directed backward. In the non-venomous kinds there are four rows on the upper part of the mouth, two rows on the jaws, and two on the palate; each division of the lower jaw is also armed with a single row. In vipers, rattlesnakes, and other venomous serpents, there are no teeth on the upper jaw except the poison-fangs; the palatal teeth, however, forming two rows as in the non-venomous kinds, the arrangement of teeth in the lower jaw being also the same. Venomous serpents do not, in fact, need the same array of teeth as the non-venomous; depending rather on the power of their venom for their prey, which they suddenly wound, and then wait till it is dead. The poison-fangs are long in comparison with the other teeth; they are two in number, firmly fixed into a movable bone; when not in use they are laid flat on the roof of the mouth, covered by a kind of sheath formed by the mucous membrane of the palate; when the animal is irritated, and about to assail its enemy or its prey, they stand out like two lancets from the upper jaw. They move with the bone into which they are fixed; and the bone and muscles are so arranged that the opening of the mouth brings them into the position for use. There is above them, and toward the back of the head, a large gland for the elaboration of the poison, which is forced through them by the action of the muscles, each fang being tubular. The tube of the fang is formed, not as by a hollowing of it, but as by a bending of it upon itself, and is situated in front. The opening near the fang's point is a narrow longitudinal fissure. The poison-fangs are very liable to be destroyed, and the germs of new ones are generally found behind them, ready to grow and supply their place.

It is sometimes stated as a distinction between venomous and non-venomous serpents that the former have only two rows of teeth on the upper part of the mouth while the latter have four. This rule must not, however, be accepted without qualification. In the marine serpents (*hydriæ*), there are rows of maxillary teeth behind the poison-fangs; and some of the venomous land-serpents, as the bongars or rock snakes of the East Indies, which, however, are not among the most venomous, have some smaller teeth in the jaw-bones behind the poison-fangs.

The venom of serpents differs very much in its deadly power in different species. The bite of some causes the death of a human being in a few minutes, so that no creatures are more formidable; that of others proves fatal after the lapse of hours; while the bite of others, such as the common viper, is seldom fatal, although causing great pain and many unpleasant consequences. "I have carefully examined all the evidence on record," says Mr. Buckland, "as regards the most efficacious internal remedy that can be given in such cases, and have come to the conclusion that nothing is so good as ammonia" (*Curiosities of Natural History*). The same writer also recommends brandy or other stimulating drinks to be taken in large quantities. But it is of the utmost importance to suck the wound as soon as possible after it has been inflicted, and no danger is to be apprehended in doing so if there be no scratch or sore about the mouth, for the poison, so deadly when it mixes with the blood, is quite innocuous when taken into the stomach.

Many antidotes to the poison of serpents are in vogue in different countries, most of them, if not all, utterly unworthy of regard. Dr. Fayrer believes that the bite of the cobra, elaps, and Russell's viper is almost certain death. Tight ligatures above the bitten part to stop the circulation of the poisoned blood; excision; cauterizing with live coal, red-hot iron, or gunpowder; application of ammonia, and repeated doses of alcohol, are the chief remedies to be tried; but they must be resorted to *immediately* after the patient has been bitten.

The peculiarities of the lungs of serpents are noticed in the article REPTILES. The heart is placed very far back in the body. The intestines have a great absorbent power, and the faeces consist only of the most indigestible portions of the prey in an extremely desiccated state; the members of the animal which has been swallowed being still often distinguishable, and hair, scales, and the like remaining unchanged.

The tongue of serpents is forked and is often thrust out of the mouth. It is vulgarly regarded as the *sting*, but serpents have no sting, their only weapons being the fangs already noticed. The only sound which serpents emit is that of hissing.

Serpents are either strictly oviparous or they are ovoviviparous. The non-venomous serpents are generally oviparous; the venomous, ovoviviparous. The eggs of those which lay eggs are generally deposited in a long string, connected by a kind of viscous substance, in some heap of decaying vegetable matter, the mother paying no further heed to them. But some serpents coil themselves around their eggs and hatch them; and it would even seem that the habits of the same species differ as to this in different climates. The eggs of serpents are not quite devoid of calcareous covering, but have so little that their integument is soft and pliable.

It has been often alleged that vipers and other serpents when alarmed, swallow their young, and eject them again after reaching a place of safety. There still remains some doubt on this curious question, which has been much discussed; and it is not improbable that the alleged proofs of it from living young ones issuing out of the body of the parent when crushed, are to be accounted for by the ovoviviparous mode of generation.

It seems probable that serpents do not possess the senses of taste or smell in great

perfection. The ear has no external opening, and no tympanum, nor is it certain that their hearing is acute, but they are remarkably sensible of the power of music, of which serpent-charmers avail themselves, both to bring them from their holes and to control them. See SERPENT-CHARMING. A European gentleman, residing in one of the mountainous parts of India, found that his flute attracted them in such numbers to his house that he was under the necessity of ceasing to play it. Their eyes are small, and are protected from the dangers to which they might otherwise be exposed, by a transparent integument connected with the skin, and which comes away with the skin when the old skin is cast off, as is the case at least once a year.

Serpents are used as food by some savage tribes. They are capable of being tamed, and some of the non-venomous species have frequently been so, and have been found useful in killing mice, rats, and other such vermin.

SERPENT-WORSHIP, or **OPHIOLATRY**. From the earliest ages serpents seem to have exercised a mysterious fascination over the popular imagination. They are constantly making their appearance in the early mythologies. In Greece and Rome they form the hair of the Furies and the lashes of their whips; a serpent surrounds the Caduceus of Mercury, is the attribute of Esculapius and Hygeia, the god and goddess of health; and with its tail in its mouth is the symbol of eternity and an attribute of Saturn. Non-venomous serpents appear to have been the object of a special worship in ancient Egypt. In India in very remote ages the serpent was a symbol of eternity, of the sun, and of the Divine Spirit. The earth itself was called Sarparajni, the serpent-queen. Snakes came to typify the annual motion through the ecliptic. To this day, when the sun is under an eclipse, the common people believe that a great dragon is devouring him. In course of time the symbol of divinity became itself divine, and was invested with a priesthood and a cult. Traces of S. W. may be found in the Vedas, while the later Puranas claim for the incarnate Naga, or serpent, near kindred with Siva and Vishnu. S. W. still exists in many parts of India. In the districts of Kolapore and Sattara, Hindus of all classes still pay yearly tribute of prayers, flowers, and food, to Naga, their serpent idol, and grand processions commemorate the hallowed day. In some parts of the Deccan temples have been reared to Naga, and in one place live snakes are caught and worshipped. A class of Brahmins claim for themselves divine honors, as being the living temples of the divine Naga. See **OPHITES**.

SERPULA, a genus of annelida, of the order *tubicole*, forming and inhabiting a calcareous tube, like that of mollusks, and therefore described in old works on conchology. Indeed, the shell of a serpula is not always easily distinguished from that of mollusks of the genus *vermetus*, although the inhabitants are extremely different; but the shell of *vermetus* has a regular spire at the apex, which is not found in that of any serpula. The serpulæ attach their shells to rocks, shells, etc. in the sea. The shell is variously contorted, and some of the species live in groups, with the shells intertwined. The wider end of the shell is open, and from it the animal protrudes its head and gills, which expand as beautiful fan-like tufts. They are in general exquisitely colored, and serpulæ are among the most interesting and beautiful creatures that can be placed in an aquarium. On the slightest alarm, they disappear completely into the tube, which then is closed by an operculum curiously framed as an appendage to the gills. The largest species are found in tropical seas, and are among the many lovely objects to be seen in looking down through clear still water on coral reefs. See *illus.*, **WORMS**, ETC., vol. XV.; also *illus.*, **OOLITE GROUP**, vol. X.

SERRANO Y DOMINGUEZ, FRANCISCO, Duke de la Torre; b. Spain, 1810; served in the war of independence. He was a member of the junta which overthrew Espartero in 1843, and after the restoration of Maria Christina, helped Narvaez overthrow Olozaga. His influence over queen Isabella after her marriage, in 1846, was so great as to cause serious dissensions between her and the king consort. He overthrew the Sotomayor ministry, which attempted his downfall, but the Salamanca ministry, though supported by him, was overthrown by public disapproval. Serrano now became a liberal, was appointed capt.gen. of Granada, was exiled in 1854 for complicity in an insurrection at Saragossa, came back during the revolution in that year, and supported the O'Donnell-Espartero cabinet. In the dissensions between them he took part with O'Donnell, and as capt.gen. of New Castile acted with O'Donnell in the *coup d'état* of 1856. He was ambassador to Paris in 1857, and capt.gen. of Madrid in 1865. Three years later he was associated with Prim and Topete at the head of the revolution, Prim taking the ministry of war, Serrano becoming commander-in-chief of the army and president of the council, and Topete minister of marine. He was presently elected regent, and remained in that office till Amadeo accepted the throne. In 1874 he became president of the executive power in Spain. His appointment as ambassador in Paris was gazetted, 1883. D. 1885.

SERTO RIUS, Q., one of the ablest Roman commanders in the later ages of the republic, was a native of Nursia, in the country of the Sabines, and began his military career in Gaul. He fought, 105 B.C., in the disastrous battle on the Rhone in which the Roman proconsul, Q. Servilius Cæpio, was defeated by the Cimbri and Teutones, and took part in the splendid victory at Aquæ Sextiæ (mod. Aix), 102 B.C., where Marius annihilated the same barbarians. On the breaking out of the sanguinary struggle between the party of the nobles under Sulla (q.v.), and the popular party headed by Marius (q.v.) (88 B.C.),

he espoused the cause of the latter. Morally, he was much superior to the military adventurers of his time; and the impression we have of him from Plutarch's picturesque biography is that of a valiant, resolute, honest, and stubborn Roman, such as was commoner in the 3d than in the 5th c. of the republic. None of the Marian generals held out so long or so successfully as he against the victorious oligarchy. He fought in conjunction with Cinna the battle at the Colline gate, which placed Rome at the mercy of the Marians, but he had no hand in the bloody massacres that followed. What we do hear of him is to his credit. He got his own troops together, and slew 4,000 of the ruffianly slaves whom Marius was permitting to plunder and ravish at will through the city. On the return of Sulla from the east (83 B.C.), Sertorius withdrew into Etruria, but finding it impossible to act in concert with the other military leaders of his party, he went to Spain, where he continued the struggle in an independent fashion. At first he was not very successful, and found it advisable to embark for Mauritania. After several adventures, in the course of which he once passed through the strait of Gibraltar, and fell in with some sailors who had visited the Atlantic islands, and whose descriptions so wrought upon his imagination, that he "was seized with a strong desire to dwell in the islands, and to live in quiet, free from tyranny and never-ending wars"—(Plutarch)—he returned to the peninsula, at the invitation of the Lusitanians, got together an army composed of natives, Libyans, and Romans, and after a time became the virtual monarch of the whole country. During 80-76 B.C., he was victorious over all his opponents, nor was it until the arrival (76 B.C.), of young Pompey ("Pompey the Great"), that he found an opponent worthy to cope with him; and even Pompey was scarcely yet his equal in military skill. Sertorius drove Pompey over the Iberus (Elbro) with heavy loss; nor was the campaign of the following year (75 B.C.), more favorable, for though Sertorius's subordinates were twice beaten, Pompey himself had no success, and was forced to write urgent letters to the senate for re-enforcements. The campaigns of the next two years were unimportant, except in so far as they show us the gradual operation of that miserable jealousy and envy of Sertorius that brought about his ruin. Perperna, and other Roman officers of the Marian party, who had fled to him in 77 B.C., when Sulla became triumphant at home, and who seem to have been a set of base adventurers, secretly stirred up the Spaniards against him, and when that artifice did not prove so successful as was hoped, they conspired against his life, and assassinated him in his own tent, 72 B.C., under circumstances of shameful perfidy. With Sertorius the Marian or popular cause sunk, until it was revived and attained final success in the person of Julius Cæsar (q.v.). Plutarch has written Sertorius's life, and Corneille has made it the subject of a tragedy.

SERTULARIA, a genus of Campanularian hydroids, in which the branched horny investment of the plant-like colony forms a cup around each polyp. The polyps are arranged in double row, and the colony is attached to stones, shells, sea-weeds, etc. Numerous species of *S.* occur round the British coasts. See *ACALEPHÆ*; *HYDRA*; and *Hincks' British Hydroid Zoophytes*.

SERUM. See *BLOOD*.

SERVAL, *Felis serval* or *leopardus serval*, one of the smaller *felidæ*, a native of South Africa, the *boschkatte*, or bush-cat, of the Cape Colony. It is about 2 ft. in length, exclusive of the tail. The serval is a beautiful animal, yellowish with black spots, the lower parts white with black spots. The fur of the serval is in great request, and is known to furriers as that of the *tiger cat*. The serval is one of the mildest and most docile of the *felidæ*. See *illus.*, *CARNIVORA*, vol. III.

SERVANT. See *MASTER AND SERVANT*.

SERVETUS, MICHAEL, or, in his native Spanish, MIGUEL SERVEDE, a notable and unfortunate speculator in theology, was b. at Villanueva, in Aragon, in 1511. At the age of nineteen he quitted Spain, and commenced the study of law at Toulouse, which he soon abandoned to devote himself with ardor to the knotty points of the reformation doctrines. In 1530 he went to Basel to hear Ecolampadius, and thence to Strasburg, where Bucer and Capito taught. His daring denial of the doctrine of the Trinity frightened or angered these divines to such a degree that they denounced him as "a wicked and cursed Spaniard." Servetus appealed from their judgment to that of the public in his *De Trinitatis Erroribus Lib. VII.* (Haguenau, 1531; modern edition, Nuremberg, 1791), and his *Dialogues* (Haguenau, 1532); but the public thought as little of his teaching as the theologians; and to avoid the odium which it had occasioned, he changed his name to Michael de Villanueva, and fled to Paris; where he studied medicine under Sylvius and Fernel, and took his degree as a physician with honors. Servetus seems to have possessed a kind of penetrating, if also rash and restless intellect, which enabled him to hit truth occasionally in his flighty researches, or, at least, to make happy guesses in the right direction. Thus, for example, he had an idea (see M. Flourens in the *Journal des Savans*, April, 1854) of the doctrine of the circulation of the blood. He attacked Galen and the faculty with his customary violence in a treatise on syrups (*Syruporum Universa Ratio*, Paris, 1537; Lyons, 1546). About this time he made the acquaintance of Calvin, with whom he had several conferences or private disputations, the result of which was a public challenge; but Servetus, after assenting to the arrange-

ments, decamped, afraid probably, and not without reason, that his precipitate imperious way of thinking did not fit him for discussing with so cool, wary, and merciless a logician as the Genevese reformer; afraid, too, perhaps, of being unceremoniously handed over to the authorities for heresy! After living successively for some time at Lyons, Charlieu, and Avignon, and supporting himself by writing for the booksellers, he found an asylum in the palace of Pierre Paulmier, archbishop of Vienne, in 1541, where he remained for some years, and wrote his famous *Christianismi Restitutio*, first published in 1553. The work has been twice reprinted, first by Dr. Meade of London (incomplete), and again by Murr, at Nuremberg, in 1790. Its celebrity is due more to the fact that it sealed the fate of its author, than to its intrinsic merits, the ideas being obscure, and the style incorrect. After its publication, Servetus wished to go to Italy, by way of Switzerland, but in passing through Geneva, was arrested and imprisoned at the instigation of Calvin (q.v.). After a long and complicated judicial procedure, Servetus was condemned to be burned, and the sentence was carried into execution, Oct. 27, 1553. The fate of Servetus, after all the palliations that can be offered are weighed, remains a dark stain on the memory of Calvin. See Willis's *Servetus and Calvin* (1877).

SERVIA (Turk. *Syryp*), a kingdom formerly included within the limits of European Turkey, but independent since 1878. It is bounded on the n. by Austria; on the e. by Wallachia and Bulgaria; on the s. by Roumelia and Bosnia; and on the w. by Bosnia. Area, 19,050 sq. m.; pop. '95, 2,288,259. The country is mountainous and densely wooded. From the interior, numerous chains proceed northward, forming massive barriers both on the eastern and western frontiers, and sloping pretty steeply toward the swampy plains along the Save and the Danube. In the extreme n.e. near Orsova they reach the very edge of the Danube, and along with the Eastern Carpathians on the opposite shore, imprison the great river within a wall of rock, known as the *Iron Gate* of the Danube. The highest of these chains is the Rudnik mountains (gathered into a knotty group about the center of the state), which in the Great Schturaz attains an elevation of 3,400 feet. The *Schumadia*, or forest, extends southward from Belgrade for 60 miles. Beautiful landscapes are everywhere to be seen. The principal rivers (Serb. *Rjeka*) flowing through the country are the Morava and Timok, affluents of the Danube; and the Kolubara, an affluent of the Save, which itself falls into the Danube at Belgrade. The climate is salubrious, but somewhat cold in the higher regions.

Constitution, etc. — S. was proclaimed a kingdom in 1882. The legislative power is vested partly in the king, partly in the national assembly (Skupschtina). There are eight ministers who assist the king in the exercise of his executive functions. The council of state, or senate, is a deliberative, not legislative body, and has the duty of drafting the laws to be submitted to the Skupschtina. The members are nominated for life, and numbered 16 in 1897. The Skupschtina consisted in 1896 of 134 members, who are elected indirectly and by ballot of the people, the voters having a property qualification. This body meets each year, but there is also a Great National Assembly, which is called to decide important constitutional questions and has double the number of representatives in the ordinary assembly. The army, as reorganized by the act of 1886, comprises an active army, a reserve, and a national militia. On a war footing in 1896, the three branches together had an estimated strength of 337,323 men. The country being almost exclusively agricultural, its principal exports are agricultural produce and fruits, together with animals and animal produce, but it is said to have considerable mineral resources. In 1894 the railway mileage was only 336. Alexander I., the ruler of Servia, is the fifth of his dynasty and the son of King Milan I. He was born in 1876, and became king under a regency in 1889, but in the spring of 1893 assumed full royal authority.

Religion, Education, and Finance. — The established religion is the Greek Orthodox, to which almost all the inhabitants belong; but there are a few thousand Roman Catholics, Mohammedans, Protestants, and Jews. The church is under a synod of bishops, of which the metropolitan of Servia is president, but all ecclesiastics are under the direction of the ministry of education and public worship. Members of other religions than that of the state are allowed freedom of worship. Primary education is compulsory and the cost of it is met partly by the state and partly by the municipalities. There are several private schools, and some special secondary schools maintained by the government, such as a military academy, commercial school, agricultural school, etc. In spite of efforts to promote education, the number of illiterates is very great. In 1890 it was estimated that only 14% could read and write. As to the finances, the main sources of revenue are direct taxes and monopolies, but the railways, public domains, posts, telegraphs, and customs also yield a considerable income. In 1897 the estimated revenue and expenditure were each between 66,000,000 and 67,000,000 dinars, the value of the dinar (which is equivalent to the franc) being in United States currency about 19.3 cents. The Servian debt, on Jan. 1, 1896, was 413,607,500 dinars, bearing interest, for the most part, at 4%.

Character. — The Servians are distinguished for the vigor of their frame, their personal valor, love of freedom, and glowing poetical spirit. Their manners and mode of life are exceedingly picturesque, and strongly prepossess a stranger in their favor.

History. — In the earliest times of which we have record, Servia was inhabited by

Thracian or Illyrian races—the Bessi, Scordisci, Dardanii, and Triballi. Shortly before Christ it was subjugated by the Romans, and under the name of *Mesia Superior* formed part of the province of Illyricum, whose fortunes it shared during the vicissitudes of the empire. Overrun successively by the Huns, Ostrogoths, Longobards, etc., it reverted to the Byzantine rulers about the middle of the 6th c., but was wrested from them by the Avars in the 7th c., to oppose whom the emperor Heraclius, about 636, invoked the aid of the Serbs from eastern Galicia. The Serbs obeyed the call, and in less than two years drove the Avars from the land, over which they themselves spread in great numbers, their settlements extending from the Morava as far w. as the Dalmatian Alps and the Adriatic, and from the Save as far s. as the Balkan and lake Scutari. About the middle of the 9th c. they were converted to Christianity by missionaries sent by the emperor Basilus, but this did not in the least abate their natural ardor for battle, and for nearly 200 years they were almost constantly at war with the neighboring Bulgarians—the inveterate enemies of their Byzantine liege lord. In 1043, however, Stephen Bogislav expelled the imperial governors; and during 1050–80 his son, Michael, made himself wholly independent, took the title of king of Servia, and procured the recognition of his royal dignity from pope Gregory VII. For the next hundred years the Serbs had to fight hard to maintain their independence, but the struggle terminated in their favor; and in 1165 Stephen Nemanja founded a dynasty which lasted for two centuries, during which period the kingdom of Servia attained the acme of its power and prosperity. Under Stephen Dushan (1336–56), the greatest monarch of the Nemanja dynasty, it embraced the whole of Macedonia, Albania, Thessaly, northern Greece, and Bulgaria. The progress of the Turkish arms, however, was fatal to its welfare, and in 1389 king Lazar fell in the disastrous battle of Kossovopolje. Sultan Bajazet divided the country between Lazar's son, Stephen, and Lazar's son-in-law, Vuk Brankovitch, but compelled both to pay tribute, and to follow him in war. Gradually the Serbs sunk more and more under the Turkish yoke, until, in 1459, Servia was thoroughly subjugated by the sultan Mahmud. It was uniformly the theater of the bloody wars between Hungary and Turkey, and frequently suffered the uttermost horrors of devastation. Prince Eugene's brilliant successes for a moment flashed a ray of hope into the miserable hearts of the long-suffering Serbs, and by the treaty of Passarowitz (1718) a considerable portion of the country was made over to Austria; but in 1739 it reverted to Turkey, and for the next 60 years the cruelty and oppressions of the pashas and their janizaries surpasses all belief. At length the unhappy people could endure the tyranny of their foreign masters no longer, and in 1801 an insurrection broke out, headed by George Czerny (q.v.), which, by the help of Russia, ended in the triumph of the patriots, and in the election of Czerny by the people as prince of Servia. The invasion of Russia by France, however, left the Serbs at the mercy of their late rulers, and the war again broke out. Czerny was forced to flee, and the tyranny of the Turks became more ferocious than ever. Again the people flew to arms under the leadership of Milosch Obrenovitch, and were a second time successful in winning back their liberties. Milosch was chosen prince of Servia in 1815. Compelled to abdicate in 1839, he was, in 1858, restored to his former dignity, which was made hereditary in his family. In July, 1876, Servia, excited by the rebellion in Herzegovina, declared war against Turkey, and was joined by Montenegro. The Servians, generally unsuccessful, in spite of the help of numerous Russian volunteers, were totally defeated at Alexinatz in September; in November an armistice was concluded; and in Mar., 1877, the conditions of peace were signed. Next month war was declared by Russia against Turkey. The sympathies of the principality were undoubted; but Servia did not venture again to take the field against Turkey till the fate of the war had been practically decided by the fall of the Turkish stronghold of Plevna in Dec., 1877. The recognition of Servia's independence and an important increase of its territory to the southward, demanded by Russia at the close of the war, were agreed to by the Berlin congress in 1878.

In 1885 war was declared by Servia against Bulgaria, but the Servian army, though large and better equipped than that of the enemy, was defeated by the military genius of Prince Alexander of Bulgaria (q.v.); and on the intervention of the great powers, a treaty of peace was signed in the same year. On March 6, 1889, king Milan abdicated in favor of his son Alexander, a child of 13, after divorcing his wife Natalie. At the present time the government is carried on in the name of Alexander by two Regents, who in May, 1891, expelled the Queen Mother from the kingdom as being engaged in intrigues looking to the establishment of Russian influence.

Language and Literature.—The Servian language, called also the Illyrian, belongs to one of the four great divisions of the Slavic family, and is more nearly allied to Russian than to Polish or Bohemian. It is distinguished from the other members of its division by the predominance of vowels, and consequently by its soft, melodious resonance. This character it owes in part to the influence of the Italian and Greek languages—the former influence being the result of commercial intercourse; the latter of community of religious belief. The long domination of the Turks has also left unmistakable traces on the Servian tongue; nevertheless it has on the whole preserved a genuine Slavic character, possessing along with the other members of that family a complete system of declension and conjugation, along with a free syntax. The old classical meters are imitated with facility in it. It is spoken (in the three dialects—Herzegovic, Razavic,

and Syrmie) by more than 7,000,000 people, of whom 4,500,000 are under Austrian, 2,500,000 under Turkish, and a few under Russian authority.

After their conversion to Christianity, the Serbs, like the Russians, employed the old Slavic church language in writing, but in two different styles, one called the church style, and the other the chancery or legal style. The most important monument of the latter is the "law-book," published by king Stephen Dushan, though the oldest extant specimens go back as far as the 11th century. The literary remains of the former are more numerous, and embrace ecclesiastical, devotional, and historical works, for the most part composed by the clergy and the monks. With George Brankovitch (b. 1645, d. 1711), who wrote a *History of Servia* from the origin of the nation to his own time, this first or mediæval period in Servian literature closes. The second or modern period is characterized in its commencement by an effort to raise the spoken language of the Serbs to the dignity of a written language. The consequence was, for a considerable time, the literary language of Servia was a chaos of confusion, writers not appearing able to make up their minds which dialect to use, and spoiling their productions by a barbarous mixture of both; and it was not till Vuk Stephanovitch published his *Grammar of the Servian Language* (1814), and his *Songs of the Servian People*, that the victory of the reformers was complete. Since then the spoken language of Servia has also become the language of literature. These Servian popular songs or ballads constitute by far the finest part of Servian literature. The picturesque scenery of the land, and the free solitary life led in the mountain ranges, kindled the imagination of the people, and awoke the voice of song at an early period. Some of the ballads—now so widely known throughout Christendom by means of translation—go back to a period anterior to the appearance of the Turks in Europe. In a wonderful manner they combine the rude strength, spirit, and *naïveté* characteristic of the ballad everywhere, with oriental fire and Greek plasticity. They are invariably unrhymed, but preserve at the same time a rhythmic measure. See Kapper's *Volkslieder der Serbien* (2 vols. Leip. 1852); and Bowring's *Servian Popular Poetry* (Lond. 1827); and Owen Meredith's *Serbske Pesme* (Lond. 1861); the last, however, a book of doubtful honesty. Among the poets who acquired distinction in the first part of the century, and have employed the vernacular, the most important is Lučyan Muschiki (died 1837), archbishop of Carlovitz, whose *Poems* appeared at Pesth in 1838. Of recent or living Servian poets, the most gifted are Branko Raditshevitz and Jovan Ilitz. As yet, science has made little progress. In another branch of the Servian people—the so-called Illyrians, especially the Dalmatians, who profess the Roman Catholic faith—literature received an earlier and more artistic development than among the Serbs of the Greek church. In the 12th c. a priest of Ducla (Dioclea) wrote a chronicle, first in Slavic, and afterward in Latin, fragments of which are still extant. During the 13th and 14th centuries devotional works in the vernacular were numerous, toward the end of the 15th c. the republic of Ragusa (Slav. Dubrovnik) obtained the name of the "Illyrian Athens" on account of the brilliant success with which it cultivated literature, art, and science. Epic, lyric, and dramatic poetry, history, and jurisprudence are all admirably represented. The list of its poets is particularly large. Toward the end of the 18th c. literary activity abated among the southern or Illyrian Serbs, but at the same time began to increase in the n., especially in Croatia and Hungary.—See Ristitz, *Ueber die Serb. Literatur* (Berl. 1853), and, in English, Talvi's *Historical View of the Languages and Literature of the Slavic Nations* (New York, 1850); as also Schafarik's *Geschichte der Südslavischen Literatur* (1864), and Novakovitch's *Istoriya srpske Knjizevnosti* (Belgrade, 1867). There are numerous grammars and dictionaries.

SERVIAN POLITICAL PARTIES. See POLITICAL PARTIES, SERVIAN.

SERVICE, *Pyrus domestica* (see PYRUS), the *Sorbus domestica* of many botanists, a tree of 50 or 60 ft. in height, with pinnated leaves, which are downy beneath, and their leaflets serrated upward, and small white flowers in panicles, a rare native of England, found also in various parts of Europe, the w. of Asia, and the n. of Africa, and cultivated for its fruit, which is obovate, and about an inch in length, resembling a small pear, but pleasant only in a doughy and over-ripened state, like the medlar. It is more cultivated in Italy, Germany, and France than in Britain. The tree is of very slow growth, and attains a great age. The timber is valuable, very heavy, fine grained, and susceptible of a high polish, possessing a strength and durability which particularly adapt it for some purposes of the machine-maker. It is used also for making mathematical rulers, etc.

SERVICE AND WORK is the name usually given to an action brought by a workman who has done work to order, or on request, or has been engaged for a specific time.

SERVICE-BERRY. See JUNE-BERRY.

SERVICE OF HEIRS is a proceeding in the law of Scotland by which the heir of a deceased owner of land has his relationship recognized and declared, and his feudal title to the land completed.

SERVITUDE, a name borrowed by the law of Scotland from the Roman law, to denote that kind of right or interest which a person often has in land of which he is not the owner, as a right to cut turf, etc. Servitudes are divided into predial and personal. A predial servitude is a right constituted over one subject or tenement by the owner of another subject or tenement; while a personal servitude is constituted over a subject in favor of a person without reference to possession of property. The only kind of per-

sonal servitude is life-rent or usufruct. The predial servitudes are those usually referred to under the head of servitude. Such a servitude being constituted in respect of the ownership of property, passes to third parties with such ownership. The tenement over which the servitude exists is called the servient tenement, and the other is called the dominant tenement. Predial servitudes are again subdivided into rural and urban, according as they affect land or houses. The usual rural servitudes as those of passage or road, pasture, feal and divot, aqueduct, thirlage, etc. Passage or road is the right which a person has to walk or drive to his house over another's land. Pasture is the right to send cattle to graze on another's lands. Feal and divot is the right to cut turfs or peats on another's land. Aqueduct is the right to have a stream of water conveyed through another's lands. Thirlage is the right to have other people's corn sent to one's mill to be ground. The urban servitudes are stillicide, light, *oneris ferendi*, etc. Stillicide is the right to have the rain from one's roof drop on another's land or house. Light is the right to prevent another from building so as to obstruct the windows of one's house. *Oneris ferendi* is the right of the owner of the flat above to have his flat supported by the flat beneath.

SERVIUS TULLIUS. See **ROME**.

SERVUS SERVORUM DEI (Lat., Servant of the Servants of God), a form of subscription adopted by the Roman pontiffs from the days of Pope Gregory the Great, by whom, according to his biographer, Paul the Deacon, it was assumed as a practical rebuke of the ambitious assumption of the title of "Ecumenical (or universal) patriarch," by John, surnamed Nesteutes, or the faster, the contemporary patriarch of Constantinople. Gregory is said, indeed, by Paul to have been the first Christian bishop by whom this humble form was employed. This, however, is certainly a mistake, the same designation having been frequently used by bishops before the time of Gregory. Gregory was probably the first of the bishops of Rome to adopt it as a distinctive title. It is found in all the letters of Gregory which Venerable Bede has preserved in his history.

SESAME GRASS (*Tripsacum dactyloides*), a species of grass of large size found on the Atlantic coast of the United States and in the gulf states. The stem is thick, and the leaves broad, somewhat resembling the sugar cane. It is generally considered too coarse for fodder.

SESAMOID BONES are small bones met with in the substance of the tendons of muscles in the neighborhood of certain joints. They derive their name from the Gr. *sēsamē*, a kind of Indian grain, which they were supposed to resemble. In the human subject, the patella is the best example; and besides it they are commonly met with only on the palmar aspect of the joint which unites the metacarpal bone with the first phalanx, and in the corresponding position in the toe, there being two in each position, and their object being to increase the leverage of the short flexor muscles of the thumb and toe. They are much more abundant in the great majority of mammals than they are in man.

SESAMUM, a genus of plants of the natural order *bignoniaceæ*, suborder *pedaliaceæ*, a suborder characterized by wingless seeds, and placentæ with woody lobes attached to the inner wall of the fruit. The calyx of sesamum is five-parted; the corolla bell-shaped and five-parted, the lowest lobe prolonged; the stamens four, two longer than the others, and a rudimentary fifth stamen; the capsule is oblong, almost four-celled, two-valved, many-seeded. The species are natives of India and Africa, and are annual plants, covered with hairs, their flowers solitary in the axils of the leaves, on very short stalks. They are so similar as to be sometimes reckoned mere varieties of one species, *S. Indicum*. The sweet oleaginous seeds are used in some countries, as in Central Africa, for making a kind of hasty-pudding. In Egypt they are eaten strewed on cakes. The bland fixed oil of sesamum, obtained from the seeds by expression, is used as an article of food, and for medicinal purposes, like olive oil. It keeps long without becoming rancid. It is much used by the women of Egypt as a cosmetic. For the sake chiefly of its oil, sesamum is much cultivated in India, China, Japan, and in many tropical and sub-tropical countries, and has been cultivated from very ancient times. It is too tender for the climate of England. The oil-cake, mixed with honey and preserved citron, is an oriental luxury. The leaves of sesamum abound in a gummy substance, which they readily impart to water, making a rich bland mucilage, which is used in the southern parts of the United States as a demulcent drink. Sesamum is sometimes called *tilseed*.

SESBA'NIA. See **DIHUNCHEE**.

SESHA is, in Hindu mythology, the great king of the serpent race, on which Vishn'u reclines on the primeval waters. He has a thousand heads, which also serve as a canopy to Vishn'u; and he upholds the world, which rests on one of his heads. His crest is ornamented with jewels. Coiled up, Sessa is the emblem of eternity. He is often also called *Vāsuki* or *Ananta*, the eternal.

SESOSTRIS, the Greek name of a celebrated Egyptian monarch, who is supposed to have conquered all Asia and Ethiopia. His name has passed into the series of those conquerors who have almost achieved universal empire. According to the Greek legendary history, when Sesostris mounted the throne of Egypt, he began his scheme of conquest, first dividing Egypt itself into 36 nomes, placing his brother as regent, and laying on him injunctions not to assume the diadem, or interfere with the royal harem. Sesostris

then marched at the head of a large army, and invaded Libya, Arabia, Asia, penetrating further e. than Darius. Advancing through Asia Minor, he invaded Europe, and subdued Thrace and Scythia, leaving a colony at Colchis on his return. In the s. he subdued Ethiopia, and placing a fleet on the Red sea, conquered the adjacent isles, and extended his dominions to India itself. On his return to Egypt from his northern campaigns, his brother, who had disobeyed his instructions, endeavored to destroy him by inviting him to a banquet at Daphnæ, and treacherously attempting to burn him and his whole family by firing the house. Sesostris threw two of his children into the fire, and making a bridge of their burning bodies, escaped. Sesostris, in his triumphs, dragged his captives attached to the wheels of his chariot. The captives were employed on the public works, the enlargement of the Hephæsteum at Memphis (q.v.), and other temples, and in the construction of canals and mounds. Memorials of his reign, it was said, were left as steles or tablets in the conquered countries: and Herodotus saw some in Palestine, which are supposed to be the tablets of Ramesses II. (see RAMESES), still existing in the pass of Nahr-el-Kelb, or the Lycus, and the sculptured rock at Nymphi, near Smyrna. Sesostris is said to have grown infirm and blind after a reign of 33 years, and to have ended his days by his own hand.

Not only does the greatest confusion and difficulty about identifying this monarch exist among modern, but also in the classical authors. Herodotus places his reign long before that of Cheops of the 4th dynasty. Dicæarchus makes him rule 3712 B.C., and is followed by Aristotle and other authors. Bunsen supposes that there were more than one monarch of this name, and that one was Tosorthos, of the 3d dynasty; another, Sesortesen II., of the 12th dynasty. Lepsius conjectures that he is the Sethos I. and Ramesses II. of the 19th dynasty. But the exploits of Sesostris seem to be a conglomeration of the conquests of the kings of the 18th and 19th dynasties, especially the Thothmes and Ramesses (q.v.), who extended the empire of Egypt far to the w. and east. No one monarch of the Egyptian monarchy can represent Sesostris. Herodotus, ii. c. 102; Diodorus, i. c. 55-57; Val. Flaccus, v. 419; Strabo, xvi.; Wilkinson, *Mann. and Cust.* i. 99-106; ii. 70; iii. 190; Lepsius, *Einleit.* s. 278; Bunsen, *Aegyptens Stelle*, book ii. 85, 86, 312-324.

SESQUIALTERA, one of the compound stops of the organ, composed of either five, four, three, or two ranks of open metal-pipes tuned in thirds, fifths, and octaves to the diapason.

SESSA, a city of southern Italy, province of Caserta, about 32 m. n.n.w. of Naples. It has a fine cathedral, a theological seminary, and a college. The city is famous for its wine. The neighboring soil is fertile. Sessa is a very ancient city; it was the capital city of the Aruncii, was afterward colonized by the Romans in 439 B.C., and was very flourishing under the Roman empire. It was raised to a duchy in the middle ages. Pop. '81, 5864; commune, 19,547.

SESSION, COURT OF. See COURT OF SESSION.

SESSIONS. See JUSTICE OF THE PEACE, QUARTER SESSIONS.

SESTER TIUS, a Roman coin, was the fourth part of the *denarius* (q.v.), and thus contained at first $2\frac{1}{2}$ *asses* or *libre*. The name is an abbreviation of the Latin *semitertius*, which was their mode of expressing $2\frac{1}{2}$; and their custom was, to derive the names of all their coins from the foundation of their money-system, the *as* (q.v.). The symbols for it were indifferently HS or IIS, the former being only a modification of the latter, which expresses two units, and S for the additional half-unit (*semitis*). In the Latin classics the phrase *sestertius-nummus*, or merely *nummus*, is frequently employed to denote this coin. When the *denarius* (q.v.) was made to contain 16 *asses*, the relation between it and the sestertius was preserved, and the latter from that time contained 4 *asses*, though the name, which was now no longer significant, was preserved. Up till the time of Augustus, when the relation of the *denarius* to the *as* was changed, the sestertius was worth about four cents of our money, but after this period it was somewhat further reduced. The sum of 1000 sestertii was called *sestertium* (after Augustus, = abt. \$50), which was the "money of account" (never a "coin") used in the reckoning of large sums of money.

SESTO FIORENTINO, a t. in Italy, province of Florence, with a pop. '81, of 4996, with commune, 14,224. Within its limits is the parish of Colonnata, containing a celebrated manufactory of porcelain. There are also manufactures of hats and cloths.

SESTRI LEVANTÉ, a seaport of n. Italy, province of Genoa. It is situated on a little bay near the mouth of the Gromolo, and has some copper mines. Its church of the nativity has some valuable paintings. Pop. '81, 2492; commune, 9650.

SESTRI PONENTÉ, a t. of n. Italy, 3 m. w. of Genoa, stands on the high-road which runs along the sea-coast. It manufactures ships, bricks, and tobacco. Pop. '81, 10,872.

SETARIA, See MILLET.

SETH, ANDREW, a Scottish philosopher, was born Dec. 20, 1856, at Edinburgh; was educated there and in Germany; became professor of logic, rhetoric, and metaphysics at St. Andrews 1887. He has published *The Development from Kant to Hegel* (1882); *Essays in Philosophical Criticism* with R. B. Haldane (1883); *Scottish Philosophy* (1885); *Hegelian-*

ism and Personality (1887). In 1891 he was made professor of logic and metaphysics in the university of Edinburgh.

SETHE, See COAL-FISH.

SETHITES, the name given to an obscure Gnostic sect of the 2d c., allied to the Ophites, or worshippers of the serpent; they belonged to that class of religionists who, in evolving what they regarded as their system, approached paganism. Accepting the Christian mode of thought and its terminology, they utterly disregarded the great facts of Scripture history, maintaining that Seth reappeared in the person of the Messiah, and affirming that they possessed books written by him.

SETI, or **SETHOS**, the name of two Egyptian kings. Seti I., son of Ramesses I. (q.v.), and father of Ramesses II. (q.v.), was the first ruler of the nineteenth dynasty, and ruled for about 27 years. Seti II., son of Menepthah, and grandson of Ramesses II., was the fourth king of the same dynasty.

SET-OFF, in law, the amount of debt due to a defendant from a plaintiff which the former is allowed to interpose as a defense to all or part of the plaintiff's demand. The plea of set-off must describe the debt with as much precision as if it were a declaration. An unliquidated or indefinite claim for damages cannot be put forward as set-off, and there must be *mutuality* between the two claims. Thus if A sues B for a debt, B cannot introduce as set-off a debt due him by A, C, and D, *jointly*. But an exception exists in the case of a trustee or *cestui que trust*.

SETON, in surgery, is an artificially produced sinus or channel, through which some substance—e.g., a skein of cotton or silk, or a long flat piece of india-rubber or gutta-percha—is passed so as to excite suppuration, and to keep the artificially formed openings patent. (The term is, however, very often employed to designate the inserted material.) Setons are established in the subcutaneous tissue of the body (1) as counter-irritants, or (2) to act as a drain on the system at large, or (3) to excite inflammation and adhesion. For the purposes of counter-irritation, setons are usually inserted in the neighborhood of the affected parts; but when intended to act as a drain on the system at large—e.g., in threatened head-affections—the nape of the neck is the part always selected. The operation is very simple. A longitudinal fold of skin over the spines of the cervical vertebrae is raised by the fingers from the deeper structures, and is transfixed by the seton-needle rather obliquely, so that one of the openings shall be rather more dependent than the other. The needle must pass somewhat deeply through the subcutaneous tissue, as, if it passed immediately beneath the skin, the latter would probably slough over the whole track of the wound. The inserted material should be smeared with oil, and may be allowed to remain undisturbed for four or five days, till there is a free discharge of matter, after which a fresh portion should be drawn daily through the wound. For the purpose of exciting local inflammation and adhesion (which is the result of the inflammation) setons are employed in the treatment of hydrocele, enlarged bursæ, ranula, bronchocele, ununited fractures, etc. In the two last-named cases, their use is, however, not unattended by danger.

SETON, ELIZABETH ANN (BAYLEY), 1774-1821; b. New York; accompanied her husband to Italy in 1803, and on his death at Pisa, returned to New York; became a Roman Catholic in 1805; taught a school in Baltimore, 1805-08. Having received a large amount from the Rev. Samuel Cooper, and being joined by her sisters-in-law, Harriet and Cecelia Seton, she established the sisters of charity, the first in the United States. They assumed the religious habit and opened a Convent at Emmitsburg, Md., in 1809. In 1812 the sisterhood numbered 20 members, and Mother Seton was chosen superior-general. In 1817 the institution was incorporated by the legislature of Maryland. At the death of the superior there were 50 members.

SETON, ROBERT, D.D., b. (of American parents) Pisa, Italy, 1839; was educated in the U. S. and Italy; graduated as a D.D. from the Roman univ., 1867, and was private chamberlain to Pope Pius IX., and domestic prelate and apostolic prothonotary of the holy see. He has been rector of St. Joseph's Rom. Cath. church in Jersey City, N. J., since 1876. He has published *Memoir, Letters and Journal of Elizabeth Seton*, 1869 (the founder of the sisters of charity in the U. S.), whose grandson he is; and *Essays on Various Subjects, chiefly Roman*, 1882.

SETON HALL COLLEGE, South Orange, Essex co., N. J., a Roman Catholic institution; organized in 1856. Its course of study extends through a term of seven years. It has a fine situation, excellent buildings, and a library of 20,000 volumes. Professors, '97, 17; students, 125. Very Rev. Joseph J. Synnott, D.D., President.

SETTE COMMUNI DI VICENZA, a district consisting of seven communes or parishes in the province of Vicenza, Italy, the language and population of which are plainly Teutonic, and have maintained themselves pure and unmixed in the midst of a Latin people from the days of the Roman republic. The inhabitants are believed by antiquaries to be descendants of the remnant of the Cimbrian army which was defeated with great slaughter by Marius, and are supposed to have escaped to the mountains, and there fixed a permanent settlement. Their language is perfectly intelligible to any German scholar. Specimens of this dialect, and of a similarly isolated Teutonic dialect which is found near Verona, are given by Adelung in the *Mithridates*, ii. p. 215.

SETTER. a kind of dog which derives its name from its habit of *setting* or crouching when it perceives the scent of game, instead of standing, like the pointer. Setters, however, are now trained to adopt the pointer's mode of standing while marking game. The setter was originally used to assist in the capture of game by the net. It is supposed to derive its origin from a mixture of the pointer and the spaniel. It is larger than the spaniel; its hair is less smooth than that of the pointer, and has more of the waved character of that of the spaniel, to which there is a resemblance also in the ears. The tail is bushy. There are several breeds of the setter. The general color of the *English setter* is a white ground, with large spots or blotches of liver-color or red. The *Irish setter* has larger legs in proportion to the size of the body. The *Scotch* or *Gordon setter* is of a rich black-and-tan color. The *Russian setter* is covered with woolly fur, much matted together. Each of these breeds has its peculiar merits. All setters have the soles of the feet well covered with hair, so that they can bear hard work on rough ground. They soon become exhausted, however, unless they have access to water. The setter is much employed by sportsmen. It is one of the most affectionate, gentle, and intelligent of dogs.

SETTLE, ELKANAH, was b. at Dunstable, in the year 1648. He completed his education at Trinity college, Oxford, which he left without taking a degree, and repaired to London, to seek his subsistence by literature. In 1671 he made something of a hit by the production of his tragedy of *Cambyzes*; and the earl of Rochester and others, wishing to annoy and insult the great Dryden, loudly hailed in him the superior genius of the two. Through the influence of Rochester, to his next tragedy, *The Empress of Morocco*, the unwonted honor was accorded of being played at Whitehall by the lords and ladies of the court, and in this way a great run was secured for it when it came before the general public. In the insolence of success, the author printed along with it a preface, in which Dryden was severely assailed. Solely in virtue of the quarrel thus engendered is Settle now remembered. In his great satire, *Absalom and Achitophel*, Dryden scourged him with his scorn, so that in some sort he survives for us, if only as a shrieking ghost. Having no real strength of talent, he speedily relapsed into obscurity. The post of poet-laureate for the city he had obtained, and he continued to retain. By writing in this capacity verses for city pageants and festivities, and producing pieces to be acted in the booths of Bartholomew fair, the some-time rival of Dryden was fain to eke out a wretched subsistence. In his destitute age, he was admitted to the Charterhouse, where in 1723 he died, his works having predeceased him.

SETTLED ESTATE, in English law, means an estate held by some tenant for life, under conditions more or less strict, defined by the deed.

SETTLEMENT, in English law, is used in two senses. In one case it means the mode of securing property on married parties, so as to regulate the succession in the event of the death of either, or it may regulate the succession of parties not married. In poor-law matters it means that kind of right which a pauper has to support by the parish by reason of his being born there, or of his renting a tenement or acquiring estate, etc. It often happens that a person becomes chargeable, that is, is entitled to be relieved by a parish in which he has no settlement, and the relieving parish can forthwith remove him to his parish of settlement. See **REMOVAL OF PAUPERS**. In Scotland, settlement, besides the above meanings, also means the general will or disposition by which one regulates the disposition of his property after death. As to settlement of paupers, see **POOR LAWS**. Marriage settlements may be made before and in consideration of the marriage, or after it. They vest the property in trustees, generally for the use of the husband and wife during their joint lives, then for the use of the survivor of them, and then for the children by the marriage. Marriage is a valuable consideration at law, and will support an agreement by a third person, though a stranger, to make a settlement upon the husband and wife and their issue. A marriage settlement made without consideration, after marriage, settling the husband's property upon the wife and children, is good against subsequent creditors, but void as to creditors at the time of settlement. The ordinary powers in marriage settlements of real estate are powers of sale and exchange, of leasing and managing, and of raising portions and jointuring.

SETUBAL (frequently and erroneously called by the English **ST. UBE'S**) is an important sea-port city of Portugal, in the province of Estremadura, 20 m. s.e. of Lisbon. It stands on the n. side of the bay of Setubal, which forms a good harbor. The harbor is furnished with a light-house and with broad and handsome quays, and is protected by two forts; but the valley in which the town itself stands is completely commanded by the heights in the vicinity. The main imports are coal, oil and tin plate; exports, salt, sardines, oranges, corks, and wine. There are manufactures of lace, corks, and stoppers. Setubal is the old Roman *Cetobriga*. In 1755 it was visited by an earthquake, from which it suffered severely. Pop. '90, 16,986.

SEVASTOPOL, or, as it is sometimes written, **SEBASTOPOL** (*Sebastopolis*, the "august city"), a Russian seaport, fortress, and arsenal in the Crimea, in the government of Taurida. It is situated near the s.w. extremity of the Crimea, on the southern side of the

magnificent harbor or roadstead of Sevastopol, one of the finest natural harbors in the world. This harbor is an inlet of the Black sea, stretching inland for about $4\frac{1}{2}$ m. from w. to e., about half a mile wide at the entrance, but immediately opening out to the width of a mile, with an average width of about half a mile up to the eastern end. It is sheltered on the n. and s. by lofty limestone ridges shutting it completely in, with a depth of water varying from 3 to 11 fathoms, and sufficient in several places to allow ships of the largest size to lie close to the shore. At the eastern end, under the heights of Inkermann, the river Tchernaya enters the harbor through low marshy ground. The South bay, or Dockyard harbor, as it is also called, extending about one and a half miles from n. to s., forms the harbor proper of Sevastopol; and between it and Quarantine bay, occupying rather more than half the peninsula thus formed, is built the chief portion of the town of Sevastopol, on ground sloping irregularly upward. The town, previous to its destruction in the siege of 1854-55, was well and substantially built of stone, with lines of streets running from n. to s., and smaller ones intersecting them at right angles, containing several handsome public edifices. The docks, constructed for the Russian government by Col. Upton, an English civil engineer, were among the most important works at Sevastopol; the dock-basin, docks, and quays were formed in the most substantial way, being partly cut in the solid rock, and lined with cement, partly built of limestone and granite. From the dockyard creek, ships were admitted into the dock basin by means of three locks, the bottom of the docks being above the sea level, and the basin was supplied with water by a canal some 12 m. in length from the Tchernaya above Inkermann—itself a work of no inconsiderable magnitude. For the defense of town and harbor from attack by sea, several forts were erected. These forts were works of immense strength, built of limestone faced with granite, on which artillery was found to make but little impression; they mounted a very large number of guns, and by their cross-fire completely protected every spot accessible to a hostile fleet. On the land side, with the exception of a slight loop-holed wall extending partially round the western side, the town, previous to the siege, was entirely undefended; but the earthworks and fortifications then successively extemporized by the genius of Gen. Todleben, which for so many months kept the armies of France and England at bay, and of which the Malakoff and the Redan were the most formidable, are now of historic fame.

The siege of Sevastopol by the allied English and French armies will rank among the most famous sieges in history; it lasted for 11 months, from Oct., 1854, to Sept., 1855; the place sustained repeated bombardments, the first of which took place Oct. 17, 1854; and the capture of the Malakoff and Redan, on Sept. 8, 1855, at length forced the Russians to evacuate it, and retire to the n. side. The town was completely ruined; the docks and forts still standing were blown up by French and English engineers, and by the treaty of Paris (1856) were not to be restored; but the restrictions were removed by the abrogation of the neutrality of the Black sea by the conference of London (1871). Before the siege the population of Sevastopol, including the garrison, amounted to about 40,000. Since, the town has been partially rebuilt, and the population in 1897 was 54,442. Sevastopol was intended to be the station of the Russian Black Sea fleet, and as such to form a standing menace to Turkey; during the siege the fleet was almost entirely destroyed, many of the ships having been sunk by the Russians across the entrance of the harbor by way of defense. The great disadvantage of Sevastopol as a naval station arises from the ravages of the *teredo navalis*, which soon render wooden vessels unseaworthy. Sevastopol was founded on the site of a small Tartar village called *Akhthiar*, immediately after the Russian conquest of the Crimea in 1783, under the orders of the empress Catherine II. The promontory on which Sevastopol stands is a spot of considerable classical and historical interest. Here, perhaps on the site now occupied by the Greek convent of St. George, w. of Balaklava, stood the temple of the Tauric Artemis, in which, according to the legend, Iphigenia, daughter of Agamemnon, was priestess.

SEVEN, frequently used as a mystical and symbolical number in the Bible, as well as among the principal nations of antiquity (the Persians, Indians, Egyptians, Greeks, Romans, etc.). The reason for the preference of this number for sacred use has been found in its consisting of *three*—the number of the sides of a triangle—and *four*—the sides of a square, these being the simplest rectilinear figures;—or in other equally vague circumstances. The real reason, however, seems to be astronomical, or rather astrological, viz., the observation of the seven planets and the phases of the moon—changing every seventh day. (See WEEK.) As instances of the use of this number in the Old Testament, we find the creation completed in seven days, wherefore the seventh day was kept sacred; every seventh year was sabbatical, and the seven times seventh year ushered in the jubel-year. The three *regalim*, or pilgrim festivals (passah, festival of weeks, and tabernacles), lasted seven days; and between the first and second of these feasts were counted seven weeks. The first day of the seventh month was a "holy convocation." The Levitical purifications lasted seven days, and the same space of time was allotted to the celebration of weddings and the mourning for the dead. In innumerable instances in the Old Testament and later Jewish writings, the number is used as a kind of round number. In the New Testament we have the churches, candlesticks, stars, trumpets, spirits, all to the number of seven; and the seven horns, and seven eyes of the Lamb. The same number appears again either divided into half ($3\frac{1}{2}$ years, Rev. xiii. 5, xi. 3, xii. 6, etc.), or multiplied by ten—seventy

Israelites go to Egypt, the exile lasts seventy years, there are seventy elders, and at a later period there are supposed to be seventy languages and seventy nations upon earth. To go back to the earlier documents, we find in a similar way the dove sent out the second time seven days after her first mission. Pharaoh's dream shows him twice seven kine, twice seven ears of corn, etc. Among the Greeks the seven was sacred to Apollo and to Dionysos, who, according to Orphic legends, was torn into seven pieces; and it was particularly sacred in Eubœa, where the number was found to pervade, as it were, almost every sacred, private, or domestic relation. On the many ancient speculations which connected the number seven with the human body and the phases of its gradual development and formation, its critical periods of sicknesses—partly still extant as superstitious notions—we cannot here dwell. The Pythagoreans made much of this number, giving it the name of Athene, Hermes, Hephaistos, Heracles, the virgin unbegotten and unbecoming (i.e., not to be obtained by multiplication), Dionysos, Rex, etc. The "seven sacraments," the "seven free arts," the "seven wise men," and many more instances, prove the importance attached to this number in the eyes not only of ancient but even of our own times. That it played an immense part in the superstitions of the middle ages need hardly be added.

SEVEN CARDINAL VIRTUES, THE, as enumerated by Augustine, one of the early Fathers of the Romish Church, were faith, hope, charity, prudence, temperance, chastity, and fortitude.

SEVEN CHAMPIONS OF CHRISTENDOM, THE, are seven men of the early days of Christianity eminent for their piety and good works. They are frequently alluded to by the old writers, and are familiar in history as the patron saints of different countries. They are St. George of England, St. Andrew of Scotland, St. Patrick of Ireland, St. David of Wales, St. Denis of France, St. James of Spain, and St. Anthony of Italy. Each of these will be found fully treated under his respective title: *The Famous History of the Seven Champions of Christianity* is the name of a romance written by Richard Johnson, about the beginning of the seventeenth century.

SEVEN CHURCHES OF ASIA is used in the Book of Revelation to specify the early christian churches of Asia Minor. See Rev. I., ii. They were located at Ephesus, Pergamos, Smyrna, Sardis, Thyatira, Philadelphia, and Laodicea.

SEVEN DEADLY SINS, THE, as enumerated by St. Augustine (q.v.), were pride, avarice, anger, gluttony, unchastity, envy, and sloth. Deadly sins were those for which formal ecclesiastical penance was deemed necessary to save sinners from everlasting punishment, and are opposed to venial sins (q.v.), for which he might obtain forgiveness by prayer and fasting. Some of the early writers added an eighth sin to the list, which was variously selected from vain-glory, gloominess, and languid indifference, but the decided preference of the writers of those days, for the so-called "mystical numbers," finally placed the number at seven, where it has since remained.

SEVEN DIALS is a name given to a locality in St. Giles, London, formerly noted as being the resort of the most wretched and degraded classes in the city. Seven streets radiate from a circular area on which formerly stood a pillar bearing a dial having seven faces. This pillar was removed in 1773.

SEVEN DOLORS OF THE BLESSED VIRGIN MARY, FEAST OF, a modern festival of the Roman Catholic church, which, although bearing the name of devotion to the virgin Mary, in reality regards those incidents in the life and passion of Christ with which his mother is most closely associated. This festival is celebrated on the Friday preceding Palm Sunday (q.v.). The "dolors" or sorrows of the Blessed Virgin have long been a favorite theme of Roman Catholic devotion, of which the pathetic *Stabat Mater Dolorosa* is the best known and most popular expression; and the festival of the seven dolors is intended to individualize the incidents of her sorrows, and to present them for meditation. The seven incidents referred to under the title of "dolors" are: 1. The prediction of Simeon (Luke ii. 34); 2. The flight into Egypt; 3. The loss of Jesus in Jerusalem; 4. The sight of Jesus bearing his cross toward Calvary; 5. The sight of Jesus upon the cross; 6. The piercing of his side with the lance; 7. His burial. This festival was instituted by pope Benedict XIII. in 1725.

SEVEN PINES, BATTLE OF. See CHICKAHOMINY.

SEVEN SLEEPERS, the heroes of a celebrated legend, which is first related by Gregory of Tours in the close of the 6th c. (*De Gloria Martyrum*, c. 95), but the date of which is assigned to the 3d c., and to the persecution of the Christians under Decius. According to the narrative, during the flight of the Christians from the persecution, seven Christians of Ephesus took refuge in a cave near the city, where they were discovered by their pursuers, who walled up the entrance, in order to starve them to death. A miracle, however, was interposed in their behalf; they fell into a preternatural sleep, in which they lay for nearly 200 years. The concealment is supposed to have taken place in 250 or 251; and it was not till the reign of Theodosius, 447, that they were reanimated. On awakening, they imagined that their sleep had been but of a single night; and on one of the party (supposing the persecution still in progress) going into the city to purchase provisions privately, he was amazed to find erected in triumph on the churches and other buildings, a cross, which, as it seemed, but a few

hours before, he had seen the object of contempt and blasphemy. When their wonderful history became known, they were conducted in triumphant procession into the city of Ephesus; but they all died at the same moment, as if by one common and mysterious destiny. The same legend reappears with variations at later periods.

SEVENTEEN-YEAR LOCUST. See LOCUST, GRASSHOPPER.

SEVENTH-DAY ADVENTISTS (see ADVENTISTS, SEVENTH-DAY), a sect whose peculiar views of prophecy were developed in 1845, just after the great Advent excitement of 1840-44. Elder James White and wife, and elder J. N. Andrews, of Maine, with elder Joseph Bates, of Mass., were the pioneers of this denomination. The first church was formed in Washington, N. H. In 1849 elder James White commenced publishing in connection with this movement. In 1855 this publishing work was removed to its present location, Battle Creek, Mich.; and in 1861 a legally incorporated association was formed under the title of the Seventh-day Adventist publishing association. Four buildings, the central one a large brick structure, are used in printing, electrotyping, binding, and other branches of the work. Nine power-presses and 100 hands are regularly employed in the publishing house, from which are issued 2 weeklies and 2 monthlies in English, 1 semi-monthly in Danish, 1 monthly in German, 1 in Swedish, and a quarterly in the Holland language. Their denominational literature embraces 18 bound books, and numerous tracts and pamphlets, many in the foreign languages above named. They had issued before the autumn of 1880, 230,000,000 pp. of books, pamphlets, and tracts. They also have a large and equally well-equipped publishing house at Oakland, Cal., from which is issued weekly *The Signs of the Times*. They publish a monthly in French at Bâle, Switzerland, and a semi-monthly in Danish at Christiania, Norway. The aggregate monthly circulation of their periodicals is about 85,000 copies.

The government of the denomination is administered by a general conference and 24 state conferences, having under their charge 600 churches with 14,000 members besides whom several thousands living in many parts of the country have as yet no organized church near them with which they can unite. The amount pledged to the Benevolence fund in 1879 was \$51,714. The churches being without settled pastors and maintaining religious services with only occasional ministerial help, the preachers are free to devote themselves chiefly to missionary work. During the summer months they hold meetings in large tents, 70 of which were used in 1879. They have a college and sanitarium at Battle Creek.

Seventh-day Adventists are distinguished from the denominations known as evangelical principally on the three following points: First, the Sabbath, which they hold to be still the seventh day of the week, as ordained in Eden; secondly, the prophecies, which they believe to teach that the second coming of Christ, personally and premillennially, is near at hand; and, thirdly, the nature of man, which they hold to be such as to show that he has no immortality out of Christ. The founders of the denomination were strenuous opposers of the use of alcoholic liquors as a beverage, and of tobacco and other narcotics; and, as the fruit of efforts then begun, the whole denomination are abstainers from the use of alcoholic drinks of all kinds. Tobacco, in all its forms, is also discarded, none addicted to the use of it being received into the churches unless they promise to abandon it immediately. Besides abstinence from these things, which is made a condition of fellowship, other useful reforms are strongly advocated. Articles of diet which experience shows to be unwholesome are little used. Meat is seldom eaten; grains, vegetables, and fruits are the staple articles of food. The reform aimed at is not limited to diet and drink. As the health of the body is greatly affected by the manner in which it is clothed, the subject of dress receives much attention. See ADVENTISTS, SEVENTH-DAY.

SEVENTH-DAY BAPTISTS. See SABBATH; BAPTISTS, SEVENTH-DAY.

SEVEN WISE MASTERS is the title of a mediæval collection of novels, important both from its contents and its widespread popularity. The idea of the work is as follows: A certain prince's son, instructed in all kinds of wisdom by seven sages, finds, from an examination of the stars, on his return to his father's court, that he is in danger of losing his life, if he speaks a word within seven days. His stepmother, whose allurements he had repelled, endeavored in revenge to persuade his father to put him to death, and each day related an artfully constructed story, with the view of furthering her wicked purpose, but its effect was daily neutralized by a rival narrative told by each of the sages. At last, on the expiry of the seven days, the prince himself was enabled to disclose the base designs of his stepmother.—The work is undoubtedly of oriental origin, yet neither the period when it was composed, nor how far it spread through the east, can be ascertained with sufficient accuracy. According to Masudi, it existed in Arabic as a translation from Indian sources before the 10th c., but none of the extant Arabic versions go back so far. Nearest to the original form appears to stand the *Eight Nights* of Nakhschebi, a Persian adaptation of the Indian *Tutiname* (Brockhaus, Leip. 1845). It passed into the literature of western Europe in the 11th or 12th c., through the medium of two redactions, a Hebrew and a Greek, the latter by Andreopulos, under the title of *Syntipas* (see *Das Buch von den sieben weisen Meistern*, translated from the Hebrew and Greek by H. Sengelmann, Halle, 1842; *Syntipas* being republished by Boissonade, Paris, 1828). The work was disseminated through Christendom; sometimes in a complete form; sometimes only particular novels were repro-

duced, under all sorts of names, and with all sorts of modifications; sometimes in verse, sometimes in prose. Latin versions began to appear about the beginning of the 13th c., and Keller has published a French metrical one, from a MS. of 1284 (*Li Romans des Sept Sages*, Tüb. 1836), and Henry Weber an English metrical one (third vol. of the *Metrical Romances*, Edin. 1810). There are several German versions, dating from the 14th century. In the 15th c. a popular German chapbook, *Von den sieben weisen Meistern*, was frequently reprinted (the first edition is dated Augsb. 1473), and is included by Simrock in his collection of German *Volksbücher*.

SEVEN WISE MEN, the collective designation of a number of Greek sages, who lived about 620-548 B.C., and devoted themselves to the cultivation of practical wisdom. Their moral and social experience was embodied in brief aphorisms, sometimes expressed in verse, sometimes in prose. The names of the seven, as usually given, are Solon (q. v.), Thales (q. v.), Pittacus (q. v.), Bias (q. v.), Chilon, Cleobulus, and Periander of Corinth; but there is not absolute unanimity among the ancients either as regards the names, the number, the history, or the sayings of these famous sages. The fragments of wisdom attributed to them which have come down to us are to be found in Orelli's *Opuscula Græcorum Veterum, Sententiosa et Moralia* (Leip. 1819), and have been translated into German by Dilthey in his *Fragmente der sieben Weisen* (Darmstadt, 1835).

SEVEN WONDERS OF THE WORLD were, in ancient times, reckoned to be the Pyramids of Egypt, the hanging gardens of Semiramis at Babylon, the temple of Diana at Ephesus, the statue of Jupiter at Olympia by Phidias, the Mausoleum (q. v.), the Colossus (q. v.) at Rhodes, and the Pharos of Alexandria. This cycle of seven wonders originated among the Greeks after the time of Alexander the Great, and they were described in a special work by Philo of Byzantium, which has been edited by Orelli.

SEVEN YEARS' WAR, THE, was the third, last, and by far the longest (1756-63) and most terrible of the contests for the possession of Silesia (q. v.). During the two former wars, the empress Maria Theresa had plenty of other work on hand in maintaining her claims to the Austrian dominions (see **SUCCESSION, WAR OF AUSTRIAN**) to offer any very effective resistance to the aggression of Frederick the Great of Prussia; but after emerging triumphantly from this contest she took advantage of the circumstance that the king of Prussia was on bad terms with all the chief continental powers except Turkey and Spain, to renew the struggle for Silesia, which had been snatched from her at the moment of her greatest straits. She found the czarina Elizabeth, the king of Poland and elector of Saxony, and Louis XV. of France (or rather Madame de Pompadour), ready to enter into an offensive and defensive treaty with her. On the other hand, Britain (then at war with France) engaged to assist Prussia with an army in Hanover, and with subsidies when necessary. Resolving to anticipate his enemies, and secure a safe basis for future operations, Frederick made a sudden advance (Aug., 1756) on Dresden with 60,000 men, took possession of the country, which he governed from this time with slight intervals to the end of the war, and cooped up the Saxon army, 18,000 strong, between Pirna and Königstein. On the Austrians under Browne advancing to relieve their allies, they were met by Frederick at Lobositz (Oct. 1), and after an indecisive contest were obliged to retreat. The Saxons then surrendered (Oct. 14), and were mostly incorporated with the Prussian army, which went into winter-quarters in Saxony and Silesia.—The *second campaign* (1757) began under more favorable auspices for the Austrian coalition, as the rapid action of Frederick had taken it somewhat by surprise in the preceding autumn; besides, Sweden (subsidized by France) became a fourth in the coalition, in order to recover Pomerania, and the German reich or empire raised an army, 33,000 strong, to assist Austria. A combined attack was now made by a French army (100,000) on Hanover; another French army (30,000) on Hesse-Cassel (an ally of Prussia), with a view to reach Saxony; an Austrian army from Bohemia on Saxony and another on Silesia, both of them at first united under marshal Daun, but latterly (1760) separated, under Daun and Loudon; the Russians (100,000) on the e. and n.e.; and the Swedes (22,000) in Pomerania; while the imperial army sometimes joined the southern French, and sometimes the w. Austrian armies. To oppose these armies, numbering in all 430,000, Frederick had the combined British-Hanoverian-Hessian army (60,000) in Hanover, and a Prussian army of 200,000 strong, which was distributed, as need required, over the various points attacked; but he relied much on the rapidity of his movements and the harmonious completeness of his plans. In April, Frederick, leaving a corps of 24,000 under Lewald to resist the Swedes and Russians, invaded Bohemia, drove in the advanced corps of the Austrians upon their main army, which he then completely routed at Prague (May 6), with a loss on his side of 18,000, and of 19,000 on the part of the Austrians. Marshals Schwerin (Prussian) and Browne (Austrian) fell in this conflict. Frederick immediately invested Prague, to which prince Charles of Lorraine, with 46,000 men, had retreated; but Daun, who advanced from Moravia to its relief, inflicted on the Prussians a crushing defeat at Kolin (June 18), and forced them to retire from Bohemia. The n. French army had meanwhile, under Marshal d'Estrées, advanced into Hanover, defeated the incapable duke of Cumberland at Hastenbeck (July 26), and compelled him to capitulate, on condition that the whole of his army, excepting the Hanoverians, should be disbanded. But the British government refused to ratify this shameful treaty, and speedily raised another army of similar com-

position, which was placed under the command of Duke Ferdinand of Brunswick, an able leader, who again drove back the French, and proved himself so capable to hold them in check, that Frederick ceased to have any apprehensions from this quarter. The s. French army under Soubise had also advanced in conjunction with the imperialists under the prince of Hildburghausen in the direction of Saxony, but Frederick was not prepared to lose this valuable vantage-ground, and falling upon them at Rossbach (q. v.) (Nov. 5), he put them completely to rout. During his absence, however, the Austrians had broken into Silesia, routed his armies, and compelled them to retire; so, compelled to use the utmost expedition in returning, he collected a small army, defeated a thrice as numerous force of Austrians under prince Charles of Lorraine at Leuthen (Dec. 5), and recovered Silesia. On the e. the Russians had appeared in great force, captured Memel, committing the most horrible devastations, and had routed Lewald at Grossjägerndorf (Aug. 30), when the change of Russian policy due to the illness and apparently impending demise of the czarina, caused them to relinquish almost all their conquests; Lewald then attacked and defeated the Swedes, driving them under the walls of Stralsund. Thus closed the second campaign, leaving matters very much as they were at the commencement.—Duke Ferdinand opened the *third campaign* (1758) by driving the French from lower Saxony, pursued them across the Rhine, and defeated them near Krefeld (June 23); but Contades, the new French commander, having obtained the co-operation of Soubise, compelled him to retrace his steps, till, receiving a re-enforcement of 12,000 British, Ferdinand again advanced, throwing Contades between the Rhine and Meuse, and Soubise between the Rhine and Main. Meanwhile Frederick had not been idle, for after being driven out of Moravia (which he had invaded in spring) by Daun, he marched northward with a portion of his army to meet the Russians, who, the czarina having recovered, had again invaded Brandenburg, and defeated them in a desperate battle at Zorndorf (Aug. 25), compelling them to retreat into Poland. Frederick's presence was next needed in Saxony, where his brother, prince Henry, was being hard pressed by Daun with superior forces; but on his arrival the Austrians retreated eastward till Oct. 14, when Daun turned, took Frederick completely by surprise, and gave him a severe defeat at Hochkirch (q. v.), though before the end of the year the Prussians were again in possession of Saxony. Thus passed another campaign with a slight advantage to the Prussians.—The *fourth campaign* (1759) (preceded by fruitless attempts at negotiation with France, on the part of Frederick), though signalized by only two great actions, was more unfortunate for Prussia. The French under Soubise had captured Frankfurt during the winter, and the duke of Brunswick, in attempting to recover it, was defeated at Bergen (April 13), by Broglie (the successor of Soubise), and compelled to resign the whole of Hesse to the French; but later in the year, his signal victory at Minden (Aug. 1) over Contades and Broglie, and that of his relative, the hereditary prince of Brunswick, at Gohfeld on the same day, recovered most of Westphalia, and drove the southern French beyond the Lahn and Rhine. But in the Saxon district, although prince Henry invaded Bohemia (April), capturing immense supplies, and cleared Franconia (May) of Austrians and imperialists, he subsequently evacuated Saxony, which was then occupied by the imperialists, and Loudon's Austrians advanced into Lusatia. In Silesia Fouqué gallantly kept the Austrians at bay; and Dohna continued to coop up the Swedes about Stralsund, keeping at the same time an eye on the Russians; but the latter soon gathered in such force that he was compelled to retreat. His successor, Wedel, in attempting to bar their advance, was routed near Züllichau (July 23), and though Frederick hastened to his assistance, attacked them at Kunersdorf (q. v.) (Aug. 12), and had almost gained the day, the arrival of Marshal Loudon with an Austrian force turned the tide, and converted this almost victory into the most signal defeat suffered by the Prussians during the whole war. On the following morning he could hardly muster 5,000 men; but, luckily, the Russians showed no inclination to follow up their victory, and by untiring perseverance, the Prussian monarch succeeded in raising another army 28,000 strong. Though it seemed almost impossible for him to prevent the meditated junction of the Russians and Austrians in Brandenburg; yet, by dint of skillful maneuvering, he succeeded in compelling the Russians to retire to Poland; and prince Henry, by cutting off their supplies, forced the Austrians into Saxony. On Nov. 21, however, he suffered a severe blow in the capture of Pinck with 11,000 Prussians, at Maxen in Saxony. With greatly diminished strength, an exhausted treasury (chiefly supplied by the English subsidy, the taxes of Saxony, and forced contributions on Mecklenburg, Saxony, and Anhalt), a desolated territory incapable of affording either men or supplies, and gloomy forebodings of the final issue, though with unflinching resolution never to yield, Frederick prepared for his *fifth campaign* (1760).—His army in Prussia, now reduced to 90,000 men, mostly foreigners and raw recruits, was still further diminished by the capture of Fouqué with 8,000 men in Silesia, followed by Marshal Loudon's conquest of that province, though the brilliant victory of Liegnitz (Aug. 15) subsequently restored him the north-western division of it; he then joined his brother, prince Henry, drove the Russians across the Oder, and Daun into Bohemia; but his strength was now becoming glaringly insufficient for the task to which he had set himself; the Russians and Austrians captured and plundered Berlin (Oct. 3); the Swedes came down from the north, and Loudon's Austrians upward through Silesia, so that he was now fairly in the toils. But, like a lion in the midst of the hunters, he turned upon

his most able and pertinacious adversary, Daun, terribly routed him at Torgau (Nov. 3) in Saxony, then drove Loudon into Glatz, and frightened away the Russians to Poland, and the Swedes to Stralsund. In the w. the fortune of Prussia was in the ascendant, and the French, defeated by prince Charles of Brunswick at Einsdorf (July 13), and by duke Ferdinand at Marburg (July 31), were again confined to Hesse.—The *sixth campaign* (1761) on the Rhine commenced still more auspiciously for Frederick, as the French were driven in detail from their strongholds, had their supplies captured, suffered defeat by the Hanoverians at Langensalza (Feb. 14), and by duke Ferdinand at Villingshausen (July 15), though in the end Broglie and Soubise again gained possession of Hesse. In Silesia Frederick attempted to bar the progress of the Austrians, so as to prevent their junction with the Russians, and so opposing 130,000 men to his poor remnant of 50,000; but in vain; however, the union was productive of no ill results to him, for scarcity of provisions speedily compelled the Russians to retreat to Poland, after which Loudon retired to upper Silesia, capturing Schweidnitz with 3,700 men on his way. In Saxony, prince Henry had to retreat before Daun, and the Prussians were ejected from Pomerania by the Russians and Swedes, all subsidies from Britain stopped by the earl of Bute after George II.'s death, and the country ravaged in all directions, so that things were now in a desperate condition, and Prussia almost at its last gasp. Frederick's assailants had cooped him up within southern Brandenburg and north-western Silesia, and though as resolute as ever to fight on, it seemed as if another campaign must bring him to final ruin. But the death of the czarina (Jan. 5, 1762) converted the most powerful of his enemies into a fast friend; Sweden, which had suffered uninterrupted reverses during the whole war, also retired from the alliance—and the *seventh campaign* (1762) commenced on equal terms, as Austria and France were almost as much exhausted as Prussia. On the refusal of Austria to submit her cause to arbitration, the czar Peter III. joined his army to that of Frederick; but his successor, Catharine II., ordered the return of the army, though her strict neutrality was of itself an immense benefit. Frederick had now no fears for the result. Nor had he any reason, as subsequent events showed, for on July 21 he drove an Austrian force from its intrenchments at Burkardorf, and following up his success, routed Daun at Reichenbach (Aug. 16), and took Schweidnitz (Oct. 9); while prince Henry, by a series of fortunate maneuvers, possessed himself of the passes of the Erzgebirge, and with the valuable aid of Seidlitz, completely overthrew the other Austrian army at Freiberg (Oct. 22); and the two Brunswicks nobly sustained the glory of Prussia at Wilhelmsthal (June 24) and Luternberg (July 23), capturing Cassel, and recovering the whole of Hesse. France now gave up a contest from which she had gathered nothing but military disgrace, and concluded treaties with Britain and Prussia; while Prussia and Austria agreed to an armistice with regard to Saxony and Silesia, of which the astute Frederick took advantage to send Kleist on a raid through Franconia and Bavaria, which had the effect of withdrawing the minor German states from the coalition. Maria Theresa was now left alone, and sorely against her will, was compelled to conclude the peace of Hubertsburg, Feb. 15, 1763, which finally acknowledged Frederick as the lord of Silesia. This long and desperate conflict made no change in the territorial distribution of Europe, but increased tenfold the moral power of Prussia, and gave its army a prestige which it retained till the battle of Jena. It cost Europe a million lives, and prostrated the strength of almost all the powers who had engaged in it.—See, for a complete account, Carlyle's *History of Frederick the Great*.

SEVERALLY, in American law, is the enjoyment by an individual of an estate in contradistinction to joint. See **JOINT AND SEVERAL**.

SEVERN, one of the most important and beautiful, and, after the Thames, the largest of the rivers of England, rises from a chalybeate spring on the eastern side of Plinlimmon, about 11 m. w. of Llanidloes, in Montgomeryshire, North Wales. Flowing eastward from its source to Llanidloes, to which town it retains its original British name of Hafren, it afterward flows n.e. to the eastern boundary of Montgomeryshire, then e.s.e., past Bridgenorth in Salop, and finally southward through Worcester and Gloucester, in which last it begins to form its estuary. It is navigable for barges to Welshpool in Montgomeryshire, 180 m. from its mouth. Its entire length is 210 m., and it drains an area of about 6,000 sq. miles. The chief affluents of the Severn are the Terne and the upper and lower Avon on the e., and the Teme and Wye on the west. A canal 18½ m. long, and navigable for vessels of 400 tons, extends from Gloucester to the upper portion of the estuary of the river, and thus materially shortens the navigation of its lower course. The Montgomery canal extends from Welshpool to Newton, and other canals establish communication between the Severn and the Thames, Trent, Mersey, and the other important rivers of the middle districts of England. The *bore*, or tidal wave, which rushes up the Severn, raises the water very considerably at Gloucester, below which embankments have been constructed along the water-course to prevent inundation. See **BRISTOL CHANNEL**.

SEVERUS, ALEXANDER. See **ALEXANDER SEVERUS**.

SEVERUS, L. SEPTIMIUS, Roman emperor, was born April 11, 146 A.D., near Leptis Magna, on the n. coast of Africa, of a family of equestrian rank; and, after receiving an excellent education, removed to Rome, where he became prætor, 178 A.D. He was subsequently commander of a legion in Gaul, and governor of Gallia Lugdunensis,

Pannonia, and other provinces. After the murder of Pertinax he was proclaimed emperor, 193 A.D., at Carnutum, and promptly marched upon Rome, where the puppet Julianus had by purchase obtained the imperial purple. His arrival before Rome was the death-signal for Julianus; and after taking vengeance on the murderers of Pertinax, converting his most formidable rival, Clodius Albinus, into an ally by creating him Cæsar, and distributing an extravagant largess to his soldiers, he marched against Pescennius Niger, and conquered him at Issus, 195 A.D. A glorious campaign in the east, and a three years' siege, followed by the capture of Byzantium, were followed by a desperate struggle with his jealous rival, Clodius Albinus, whom, after an obstinate conflict at Lyons, in which 150,000 were engaged on each side, he conquered, 197 A.D. The usual games to the degenerate citizens of Rome, and largesses to the troops, followed, after which Severus returned to Asia, accompanied by his sons Caracalla and Geta, met with the most brilliant success in the campaign of 198 A.D. against the Parthians, and took and plundered their capital, Ctesiphon. After a war with the Arabs, in which Severus's usual good fortune deserted him, and a general visit to his various eastern dominions, he returned to Rome, 202 A.D., and gratified the popular taste by the exhibition of shows of unparalleled magnificence, also distributing another extravagant largess to the citizens and prætorians. A rebellion in Britain drew him to that country in 208 A.D.; and, at the head of an immense army, he marched, it is said, to the extreme n. of the island, encountering enormous hardships, to which no less than 50,000 of his soldiers succumbed, and securing no permanent advantages. To secure to some extent the natives of s. Britain from the incursions of the Meate and Caledonians, Severus commenced the wall which bears his name, and died soon after at York, Feb. 4, 211 A.D. Severus was an able, vigorous, and just ruler, and a skillful warrior, but totally devoid of high moral sentiment, a deficiency especially observable in cases where his own interests were involved.

SEVERUS, WALL OF, a rampart of stone built by the Roman emperor Hadrian in Britain, 120 A.D., between the Tyne and the Solway. On the first subjugation of Britain by the Romans, a line of forts had been constructed by Agricola, extending from the Forth at Edinburgh to the Clyde at Dumbarton. The emperor Hadrian, on visiting Britain, 120 A.D., threw up for the protection of the Roman province a wall of turf extending across the narrowest part of the island, between Tyne and Solway. Twenty years later Antoninus Pius, whose lieutenant, Lollius Urbicus, had gained fresh advantages over the northern tribes, endeavored to check the inroads of the Caledonians by erecting another rampart of earth between the Forth and Clyde, connecting Agricola's line forts. But after a vain struggle of 60 years, the Romans found it necessary to abandon the whole district between the walls, and Septimius Severus repaired the wall of Hadrian, which thus became erroneously called the wall of S. Toward the close of the 4th c. Theodosius, for a brief period, reasserted the Roman dominion over the district between the walls of Antonine and Severus, which, in honor of the emperor Valens, obtained the name of Valentinian. But this newly-established province was soon lost, and it was not long before the Romans finally abandoned Britain. Many remains of the Roman walls are yet to be traced. See Bruce's *Roman Wall*, 3d ed. 1885.

SEVIER', a co. in s.w. Arkansas, having the territorial line of the Indian territory for its w. boundary, 547 sq. m.; pop. '90, 10,072, chiefly of American birth, incl. colored. The Little river forms its s. boundary, and it is drained by that river and its branches, one of which is its e. border. Its surface is diversified, a large proportion covered with hickory, oak, pine, and osage orange. Its soil is fertile; producing cotton, maize, sweet-potatoes, tobacco, etc. Its mineral products are lead, limestone, and slate. Co. seat, Lockesburg.

SEVIER', a co. in e. Tennessee, having the Great Smoky or Unaka mountains for its s. boundary, separating it from North Carolina; 560 sq. m.; pop. '90, 18,761, chiefly of American birth, with colored. It is drained by the French Broad and Little Pigeon rivers in the n., the former dividing a ridge of mountains. The central portion sinks into valleys and bottom lands of great beauty and fertility. In the hills are ledges of limestone and beds of iron ore. The surface is well timbered with oak, pine, and sugar-maple. The soil produces wheat, corn, oats, tobacco, maple sugar, and sorghum. Large numbers of cattle are raised. Co. seat, Sevierville.

SEVIER', a central co. in Utah, bounded on the w. by the Wahsatch mountains; drained by the Sevier river and Salt, Otter, and Curtis creeks; pop. '90, 6199, chiefly of American birth. The surface is table land or plain. The soil is arid. Area, 1872 sq. m. Co. seat, Richfield.

SEVIER, JOHN, 1745-1815; b. Va., explored the Holston river, in Tennessee, in 1769; built fort Watauga and defended it. He participated in Dunmore's expedition with the rank of capt., and fought in the battle of Point Pleasant. In 1772 he was delegate to a convention at Halifax, N. C.; member of the assembly, 1777; lieutenant-col. in the same year, and in 1779 gained a victory at Boyd's creek, and was a leader at King's mountain, 1780, receiving, in recognition of his services, a sword and the thanks of the legislature of North Carolina. He took part in the battle of Musgrove's mills, and in 1781 fought under Marion, and was made brig.-gen. In 1794 governor of Ten-

nessee, then called Franklin. In 1786 he went to war with the Cherokees; governor of the newly organized state of Tennessee, 1788-1801 and 1803-9; member of congress, 1811-15. He died on a mission to the Creek Indians.

SEVIER, LAKE, a considerable body of salt water in Millard co., s.w. Utah, at an elevation of 4600 ft. above the level of the sea; 188 sq.m.; 20 m. in length from n. to s., 10 m. wide. Its position is 120 m. s.w. of Great Salt lake, with no outlet; it is destitute of islands; its shores have no trees and few bushes. The Sevier river, its only tributary, empties into the n. portion. It is in Pauvan valley, a part of the Sevier desert. It is open only on the n. side, the House range of mountains guarding the w. border, and the Beaver creek range the eastern. Gulls and other birds which feed on fish, frequent the mouth of the river, seeking fresh-water fish which have come down through the river, and have died from the effect of the brine. Shrimps and insect larvæ are found in the water. In 1872 the brine was found, on being analyzed, to contain 62.3 parts in 1000 of chloride of sodium, 13.4 of sulphate of soda, 10.3 of chloride of magnesium, and 0.4 of sulphate of lime. The action of the atmosphere determines its extent; in dry weather its beaches recede; moisture in the air has the contrary effect. The water once occupied most of the Sevier desert, discharging into Salt lake, the channel being still visible 50 m. n. of the present boundary between the Sevier and Salt lake deserts. The track of the current is called the Old River bed, where the springs occur only in intervals of 50 miles. There was a time when the waters of Great Salt and Sevier lakes united in one large lake called Bonneville, with outlets through Snake and Columbia rivers. The shore lines are defined by fresh-water shells, showing that it covered Great Salt lake, Sevier, and Escalante deserts, and overflowed into the valleys of Utah, Juab, Rush, Skull, Preuss, Snake, and Cedar. Its former level was 575 ft. above the level of Sevier lake in 1872, and 968 ft. above Great Salt lake in 1873, and it was 125 m. wide.

SEVIGNÉ, MARIE DE RABUTIN-CHANTAL, Marquise de, was b. at Paris, Feb. 6, 1626. She was the only daughter of the baron de Chantal, Celse-Benigne de Rabutin, and his wife, Marie de Coulange. She was left early an orphan; and at the age of six the care of her education devolved on her maternal uncle, the abbé de Coulange, an excellent and amiable man, who most conscientiously acquitted himself of his charge, and for whom through life his niece entertained the tenderest affection. She was carefully instructed in all the knowledge which then appertained to the education of a French gentlewoman; by the eminent scholar Menage she was taught Latin, Italian, and Spanish; and M. Chapelain, another literary notability of the time, also assisted in her culture. At the age of 18 (Aug. 1, 1644), she was married to the marquis Henri de Sévigné, the representative of an ancient house in Brittany. The union was not a happy one. The marquis was "a man of wit and pleasure," of the type of the period; his wit he exhibited by his happy way of squandering his wife's fortune, and he took his pleasure in neglect of her, and addiction to other women. After a time, he was killed in a duel (Feb. 5, 1651), by a certain chevalier d'Albret, his rival in a love-affair. Left with a son and daughter, Sévigné now for a few years retired almost wholly from society, and devoted herself to their education. In 1654 she returned to Paris, where her beauty, her wit, her happy social tact and vivacity, concurred, with the charm of her sweet and kindly nature, to insure her unrivaled success in the brilliant society of the period. Her lovers were legion, and among them were numbered some of the most distinguished men of whom France could then boast, as the prince de Conti, Turenne, Fouquet the superintendent of finance, and others. But they sighed in vain: all offers of marriage she steadily declined; and from any of those lighter ties, there and then most leniently looked on—if not almost considered *comme il faut*—she has left no spot upon her reputation. For her virtue she must have credit as virtue, and not merely the coldness which simulates it; for she was obviously of a warm, eager, even somewhat impulsive nature. Her numerous and warm friendships, with her absolute devotion to her children, may have sufficed as food of a heart not unlikely, in lack of these, to have craved a more perilous diet. Her affection for her daughter in particular, who in 1669 became Madame de Grignan, was the ruling passion of her life; and to the separation of the mother, over long periods, from "this infinitely dear child," the world is indebted for by much the larger moiety of the collection of letters which has given fame in perpetuity to Madame de Sévigné. Madame de Grignan was one of the most beautiful and accomplished women of her time, and every way worthy of the love thus lavished without stint upon her. If she did not reciprocate its full fervor, *that*, as the shrewd mother well knew, was simply in the nature of the case; and not to have demonstrated in return more rapture than she really felt, ought to count as a point in her favor, rather than reverse-wise as it has been held to do. If it was the one main grief of Madame de Sévigné to be forced to live apart from her daughter, the happiness of dying beside her may perhaps have a little consoled her for it. In 1696, while on a visit to the château de Grignan, she was seized with malignant small-pox, and died at the age of 70.

The letters of Madame de Sévigné, on which her fame securely rests, are charming in the *abandon* and easy *naïve* frankness with which they reveal her beautiful nature. They sparkle with French *esprit* and spontaneous gaiety of heart; and their writer is scarce anywhere quite equaled in the delicate *finesse* with which, in a few careless rapid words, she flings off a scrap of light narrative, dashes in a little graceful picture, or

points a dramatic situation. Above all remarkable is the lightly-moved and ever-active sympathy which keeps her exquisitely *en rapport* with the interest of whatever may be passing before her. The best edition of the letters is that of Monmerqué and others, 14 vols. (1865-67). See the studies by Boissier (1887), and Mason's *Women of the French Salons* (1891).

SEVILLE, a province of Spain, included under the division of Andalusia; bordering on the Atlantic to the s. and s.w.; bounded n. by Estremadura, and w. by Portugal; 5295 sq. m.; pop. '87, 544,815. The greater part of the surface is a plain, through which the Guadalquivir river flows. In the n. are the Morena mountains; the s. is hilly. Most of the land is highly fertile; cotton, tobacco, olives, grapes, wheat, and maize are raised in large quantities. There is considerable cattle raising, and there are mines of silver, coal, iron, lead, and copper. The province was once occupied by the Moors, and their ruined walls and castles are still to be seen. Besides the capital Seville, Carmona and Ecija are the chief towns.

SEVILLE (Span. *Sevilla*, the *Hispalis* of the Romans), a famous city of Spain, formerly capital of the ancient kingdom, and now of the modern province of the same name, stands on the left bank of the Guadalquivir, 356 m. by railway s.w. of Madrid. The city is almost circular in shape, is surrounded by Moorish walls, surmounted with 66 (formerly 166) towers, and pierced with 15 gates, and is 5 m., or, including its 10 suburbs, 10 m. in circumference. Held by the Moors for five centuries, and entirely rebuilt by them from the materials of former Roman edifices, Seville was long a purely Moorish city, and the old Moorish houses, which age, in this dry climate, has done little to destroy, are still the best houses to be seen. The narrow tortuous streets that kept out the sun, with their wide spacious mansions, with ample courts and gardens, so perfectly suited to the climate, are giving way to spacious straight streets of small, hot houses, open to the blaze of noon. The cathedral, one of the largest and finest in Spain, is an imposing edifice, of which the solemn and grandiose are the distinctive qualities. It was completed in 1519, is 431 ft. long, 315 ft. wide, and the nave is 150 ft. high. The pavement is in black and white checkered marble. The cathedral is superbly decorated. Its painted windows are among the finest in Spain, and it contains paintings by Murillo, Vargas, the Herreras, etc. Attached to the cathedral is one of the most remarkable towers in the world. It is called the Giralda (i.e., a weathercock in the form of a statue), and is in all 350 ft. high. This Moorish tower was built in 1196, and was originally only 250 ft. high, the additional 100 ft. being the rich filigree belfry added in 1568. The pinnacle is crowned by a female figure in bronze, 14 ft. high, and 2800 lbs. in weight, and which veers about with the slightest breeze. From this great tower the *mueddin* (q.v.) of Mohammedan days called the faithful to prayers. The royal residence, the Alcazar (*Al-Kasr*, house of Cæsar), contains several noble halls, and much delicate ornamentation, that rivals that of the Alhambra. The Torre del Oro, or tower of gold, is of octagonal shape and Moorish design. The house in which Murillo lived and died is still to be seen here. The finest pictures in Seville are to be seen in the cathedral, the Caridad, the Museo, and the university. Besides the university there are industrial, normal, and many other schools. The city contains upward of 100 squares. The Fabrica de Tabacos, where tobacco is made into snuff and cigars, employs several thousand hands, mostly females. The Plaza de Toros can accommodate upward of 12,000 spectators. Water is supplied from a number of aqueducts, one of which was built by Julius Cæsar and rebuilt by the Moors. It rests on 410 arches. There are here several royal foundries and factories for arms, and porcelain and iron and machine works. Weaving, soap-making, and the manufacture of saltpeter, powder, leather, soap, cotton, thread, etc., is carried on. Pop. '87, 143,182.

The Hispal of the Phenicians, the Hispalis of the Romans, was corrupted by the Moors into Ishbilliah, of which it is supposed the modern name is a modification. It was a place of great importance in the later period of Roman dominion; became the capital of southern Spain during the ascendancy of the Vandals and the Goths, when it was the scene of two notable church councils (590 A.D. and 619 A.D.); and fell into the hands of the Moors in the 8th c., under whom it rapidly rose to a splendid prosperity, and reckoned 400,000 inhabitants. In 1026 it became the capital of the Moorish kingdom ruled by the Abadides, from whom it passed, in 1091, to the Almoravides, and in 1147 to the Almohades. In 1248 it was taken by Ferdinand III. of Castile, when 300,000 Moors left for Grenada and Africa; and from this time to the removal of the court to Valladolid, in the reign of Charles V., Seville was the capital of Spain. The city rose to its climax of prosperity after the discovery of the new world, when it became the residence of princely merchants, and the mart of the colonies, but its trade was afterward transferred to Cadiz. In 1810 it was taken and ravaged by Soult.

SÈVRES, a small t. of France, in the dep. of Seine-et-Oise, 6 m. s.w. of Paris, on the Paris and Versailles railway. It is celebrated for its manufacture of porcelain wares, which are unsurpassed for elegance of design and beauty of painting. Painted glass is also manufactured. The porcelain museum, which was destroyed during the war of 1870, contained a large and curious collection of articles in china and earthenware from all parts of the globe. There are also manufactures of sweetmeats, crystals, carriages, and bleaches. Pop. '91, 6902.

SÈVRES, DEUX, an inland dep. in the w. of France, between the deps. of Vienne on the e. and Vendée on the w. Area, 2,317 sq. m.; pop. '96, 346,694. The dep. takes its name from two rivers of the same name, the Sèvre-Niortaise, which flows w. into the

sea and the Sèvre-Nantaise, an affluent of the Loire. It is traversed from s.e. to n.w. by a chain of hills, called in the s.e. the *Monts du Poitou*, and in the n., the *Plateau de Gatine*. This ridge forms the water-shed between the Loire on the n. and the Charente on the south. The climate is generally healthy, and the soil is very fertile. There are numerous coal and iron mines, and good quarries of freestone and marble. The cereals, the vine, sugarbeet, flax, and various fruits are raised. The *arrondissements* are Niort, Bressuire, Molle, and Parthenay. Niort is the capital.

SEWAGE. It is of the first importance to health for houses, both in the town and in the country, that all filth should be removed from them as speedily as possible, and disposed of in such a manner as to cease to be injurious to mankind. It may be taken as a pretty safe general guide, that all matters which give off a disagreeable smell are dangerous if allowed to remain near our dwellings; nature thus giving us warning of the presence of something that may do us harm. Many people have thought that if, by using certain deodorizing materials, they could either fix this effluvium permanently or for a time, they had surmounted the difficulty; but this is scarcely half a cure, and a palliative like this is much less advisable than a radical measure of removing the filth by suspension in water, and rendering of it not only innocuous, but beneficial, by incorporating it with the great deodorizer—living vegetation. It seems as if nature had planned all this for us, if we will only follow her teaching. During the first two or three days after sewage is deposited in water, the smell is unpleasant, but not dangerous to mankind; after that, putrefaction begins, and the gases given off become deleterious. Here, then, is time for removal, and a punishment for neglect. Fevers, gangrene, ophthalmia, and many other diseases, especially among children, are certain to break out and become malignant if the emanations from such filth exist in the air around human habitations. Until within the last 50 years, privy-pits and cesspools prevailed everywhere. In the country the former were generally placed in the garden attached to the house, and at some distance off, so that there was not much danger attached to them. In the towns cesspools existed among the houses, but they were very objectionable and dangerous, and constantly neglected. These cesspools were large underground tanks built in brickwork, into which all the sewage from the house was discharged. In them the filth accumulated and putrified until it was periodically removed by manual labor. They acted like an immense brewing vessel sending up deadly vapors which had no escape, except back into the house among the inhabitants. The cesspools also frequently leaked, and so if any wells were near poisoned the water. When Bramah invented the water-closet, and a larger supply of water had to be found for towns, the cesspools began to overflow at such a rate that a general revision of the whole system became necessary, and at the same time medical men insisted upon the continuous and perfect removal of filth as the only reliable sanitary process of dealing with the matter. A return to the use of cesspools in any form would therefore be a step in the wrong direction, and would lead to disastrous results.

We may divide the subject as follows: 1. The management of the sewage of cottages; 2. Dwelling-houses and public buildings in the country; 3. Towns; and 4. The utilization of sewage.

1. *Cottages.*—It is obvious that in the case of single detached cottages expensive arrangements such as those necessary for water-closets could not be provided, and some simpler plan must be followed.

It is very objectionable to allow either cesspool or privy-pit, if they can be avoided, as they are constantly neglected, and overflow into some stream, or poison the wells and the air. The privy should be placed, wherever that can be managed, on the n. or e. side, and to the rear of the house, so as not to be between the people and the sun and softest winds. The whole sewage-matter should be received in a square galvanized iron pail underneath a seat, which pail can be removed from the outside, and into which a small quantity of house-ashes should be placed, either daily, or as often as the closet is used. This will quite fix the ammonia. The iron pail must be removed by the cottagers at least once a week, and emptied into their garden. No danger can possibly arise from this, if strictly followed, and all the sewage-matter is placed to its best purpose. There has not been found any difficulty in introducing this system among cottagers.

2. *Dwelling-houses and Public Buildings in the Country.*—It would be useless to discuss a dry-earth system like what has been mentioned anywhere but for outhouses attached to cottages; the general feelings of the inhabitants would not tolerate it. We must therefore accept the water-closet as the system universally adopted. In planning the position of water-closets for a house, the first thing to be thought of is, that they shall be if possible on the n. or cool side of the house, and upon exterior walls. If they are placed in the interior of the house, it is troublesome to get at the drains when required, and the closets themselves cannot be sufficiently ventilated. If the closet is inside the house, then Bramah's patent with a D trap underneath is the only form that should be used; but if the closet is outside, then a less expensive one with a syphon earthenware trap may be adopted. It is desirable that the closet should be surrounded with brick walls, and, in fact, isolated from all other parts of the house. The window of the closet when inside the house should always reach the ceiling; and a ventilating

shaft is desirable where the closet is much used, and the window must be shut occasionally. The ordinary water that passes into the drains leading from any closet—such as is discharged each time that the handle is raised—is not sufficient to sweep out thoroughly all the solid matter from the drain-pipes, and therefore a flushing apparatus at the highest point of all sets of drains is essential, so that a body of water may be allowed to pass down with a rush at least twice or three times a week. It is also desirable that the foul air engendered in the drain-pipes themselves should have some free outlet into the air at some point where it will not be injurious. The gas given off under such circumstances is of a very light character, and has a great tendency to ascend and draw toward heat. During the greater part of the year, especially since the system has been introduced of heating houses by hot air, the temperature of living-rooms is much higher than the atmosphere outside; a pumping action is exercised upon the drains, or indeed upon any outlet, for a fresh supply. If, therefore, some safety-valve is not provided, the gas will force an entry through the traps or some imperfection in the joints of the drains. In constructing the drains from houses or large public buildings, it is now a well-decided point that there should be an entirely separate system for the sewage or foul water, apart from that for rain and surface-water. The reasons are many and obvious, but they are given more appropriately under the head of the drainage of towns. Stone-ware pipes are the best material to be used for drains, because they are perfectly non-absorbent; but in many cases glazed earthenware will answer very well. The smallest size of pipes of any description that should be used for removing sewage from a house is 6 in. in diameter. This size, then, may be gradually increased as is necessary, and one of 9 in. will remove the sewage of 500 people. The best fall to be given to a sewage-drain is 1 in. in 10 ft.; but all will work well from 1 in. in 5 ft. up to 1 in. in 60—provided the flushing arrangements are as they ought to be. In order to keep the drains clean, not less than 10 gal. of water daily should pass down the drain for every person in the house; while anything over 25 gal. is superfluous. At every 20 yards there should be a pipe laid from which the upper half can be removed, and the interior inspected at any time, and any stoppage remedied without the necessity of breaking the pipes. Greasy water, such as is poured down from the kitchen and scullery of a house, is one of the constant causes of such stoppages. The fat, as it cools, congeals on the sides of the pipes, and forms a hard cake. The best method of preventing this is to form a small cesspool, into which the kitchen water is poured first, and then to take an overflow through a syphon into the foul drain, so that the liquid only enters, while the fat can be removed by hand from the cesspool. The sewage-matter having been thus all thoroughly removed from the house, a sewage-filter should be built. The solid and liquid matters of the sewage are here mechanically separated, and the former can be removed from time to time—say once in six weeks or two months—while the latter must be passed on for irrigation. It is clearly illegal to pass it into any stream; and it is apt to become a serious nuisance if anything else is done with it. We shall treat of the best method of utilizing this liquid under the fourth head. It is always advisable to get space for all these arrangements on the n. and e. side of a house, when possible, so as to run no risk of contaminating the air on the s. or hot side of a dwelling; and if a belt of trees can be placed between the sewage-filter and the irrigated land and the house, it will also be advantageous.

3. *The Drainage of Towns.*—Until within the last 40 years, the only drainage which existed in towns was for the rain-water and surface-water alone, and the inhabitants were strictly watched to prevent their passing any sewage matter into these drains. The introduction of the water-closet, however, gradually increased the water which overflowed from the old cesspools to such an extent that it was impossible to prevent overflows of this description, and systems of drainage were designed to carry off the whole, both sewage and rain-water. A very composite system of drainage then arose. Generally, the bed of some stream or natural rivulet passing through the town was covered over, and the whole filth passed into that along with the rain-fall of the district. This soon was found unsatisfactory, because the flood-waters of the stream were not to be relied on to keep the channel clean, and so the filth remained festering underneath the ground, giving off deadly gases in the midst of the population. The next arrangement which succeeded to that system was to plan large drains for the rain and surface-water and sewage, and still keeping the idea of the size of the bed of a natural stream before them, engineers thought it necessary to make all the main drains large enough for a man to pass through them, and keep them clean. Seeing the vast quantity of sand and grit that was occasionally washed off the streets, something might be said in defense of this system. Vast numbers of these great main sewers still exist. Into these sewers all the smaller house-drains were to enter, and the surface-water through street-gratings as well. The ordinary water used for domestic purposes, and the occasional rain-falls, were relied upon to flush those large main sewers; but their great size made this an exceedingly difficult and uncertain process, and they, in fact, became only cesspools elongated. In dry weather, the filth was retained in them to such an extent, that after heavy rains, chemical analysis showed that the water that was discharged contained frequently twenty times the amount of human fecal matter per gallon more than it did in dry weather. This state of matters, added to the fact that long-continued dry weather was

always attended by an increase of deaths from typhus and other fevers, clearly showed that something more must be done. A further step was then taken by sanitary engineers. The idea of men passing up the drains was set aside, and the smallest possible drains were constructed, until these have arrived at such dimensions as an 18 in. main drain for a town of 10,000 inhabitants. The rain-fall was still to be relied on to a certain extent for flushing purposes, but a supplementary assistance was to be given at some points by flushing with water from the ordinary regular supply of the town. As these smaller drains were not sufficient to carry off all the surface and rain-water, as well as the sewage, overflow weirs have been provided at certain points, where the excess must go over, and pass away into some other channel. This is the system now most generally adopted, and is better than its predecessors; but it is now decided that it, in its turn, must give way to something better, and the change has commenced. The necessity of dealing with the sewage at the main outfall, and the utilization of it for agricultural fertilization, while, in nine cases out of ten, pumping must be employed to lift the sewage of a town at the discharging point for such a purpose, have gradually forced upon us the conviction that the sewage and household water must be kept quite distinct from the surface-water, subsoil water, and rain-fall.

The outfall of the sewage drain, and subsequent disposal of the filth, are in reality the first things to be considered. Hitherto, engineers in general have taken the nearest stream, and polluted it to such an extent, that perpetual law-suits, nuisances, and diseases have been the result. Fever of the worst class is certain to follow the drinking of water tainted in this manner, and there is scarcely a stream in the interior of the country which has not been injured more or less from this cause.

Again, where the sewage has been emptied into the sea, tide-locked drains are objectionable, and the sewage, when mixed with salt water, generally gives off more stench than ever. We may briefly say that all attempts at deodorization by chemical processes have hitherto failed, and as far as our present knowledge goes, are not to be relied upon. The utilization of the sewage on the fields by irrigation is, therefore, the true solution of the problem, and we must arrive at the simplest, cheapest, most certain, and most perfect system of accomplishing this. When sewage and rain-fall all go together in the same drains, as they do in all the older systems, all is uncertainty; while when the two are separated, rain and surface-water can be discharged at any point into the natural water-courses of the country, and a fixed quantity of sewage, with household and flushing water, would be passed to the main outlet, to be there dealt with. The opponents of this system say that it is too expensive and troublesome to plan; that it is unnecessary, as it is sufficient if engineers provide for the dry-weather flow of the sewage, and use that for irrigation; and that when the overflows come into action in floods, the whole is so much diluted, that no harm is done to any one. The advocates of this double system of drainage have proved that the total separation of the two is the most sanitary system, because the street-gratings and rain-water pipes, which at present let down the rain-water into the sewage drains, act, in fact, as so many ventilating shafts, and discharge the stench in the midst of the inhabitants; while, under a separate system, the sewage-pipe would be entirely sealed up, and only ventilated at such places as could safely be done; that the rain-water as a flushing power ought to be entirely discarded, as it fails in dry weather, just when it is most wanted; that in wet weather, and winter again, when the discharging of the sewage on to the surface of land is carried out, the great quantity of water sent down through the drains by the present system is agriculturally a serious injury; that when pumping has to be employed for lifting the liquid for irrigation, as it is in most cases, all is uncertainty, and that no machinery can be economical and efficient under such circumstances, and that the planning of the irrigation also becomes difficult to manage, and irregular. With regard to the expense, it has been proved that, as the rain-water and surface-water can be discharged at the nearest point, all the drains may be much lessened in size; and further, that the flushing power of the water in the sewage-drains will be much more efficient, while the corresponding lessening of the expense in carrying out the process of utilization will completely compensate any additional outlay that may be incurred in laying the drains in towns. If we take the case, which is a common one, of a pop. of 10,000 people living upon a sq. m., the first-mentioned system, where rain and sewage-water go together, would require pumping machinery, in dry weather, of, say, five horse-power, to lift the liquid; and it would further be necessary, for wet weather, to have in reserve a lifting power of 150 horses; while, on the separate system, where the sewage alone would have to be dealt with, the five horse-power engine would be regularly and constantly employed, and its work would be almost entirely confined to the daytime, whereas the other must be ready at any time, and for every emergency. The system of sending sewage and rain-water together has been hitherto adopted in all towns; but except in one or two cases where gravitation has been available to utilize the discharge from the drainage, all engineers have failed to prevent the pollution of rivers, and it is obvious that something else must be tried, as that cannot be permitted to go on much longer. The system of separating the sewage and rain-water has been carried out in several large asylums and public buildings, many barracks, the town of Eton, and Windsor castle—where every consideration, both of expense and sanitary influence, was brought to bear on the subject. Reading, Oxford, and several other towns are fast

following on the same principles, and the results are hitherto most satisfactory. Great economy has resulted from the process.

4. *The Utilization of Sewage.*—The whole of the sewage of a house or town having been conveyed away in the manner we have described, the next important step is to know what to do with it. Above all things, it is desirable to add to the productiveness of the soil, so as to compensate in some degree for the constant supply we are drawing from that source.

The liquid nature of sewage, adopting as we may the ordinary amount of dilution in dry weather at the rate of 25 gals. per head, has been a great obstacle in the way; while also the vast quantities of road-grit, and the great glut of rain that come down along with the sewage when there is only one system of drains in a town, have upset all arrangements and calculations. Many attempts have been made, especially at Leicester, some years ago, to precipitate all the valuable qualities of the sewage by impregnating the whole with milk of lime; but the process was unremunerative to those who did it, as so much sand was precipitated at the same time, that the product obtained was almost worthless as a manure; while, as the greater part of the ammonia escaped in the water, the discharging of it into any stream was still, strictly speaking, quite illegal. As far as chemical knowledge can guide us, there seems at present to be no hope in this direction.

At Edinburgh, again, and at Croydon, the irrigation of land by gravitation has rendered the process a simple one, because the whole has been poured over the land with many excellent results. These, however, are clearly exceptional cases, and we must look to pumping as being necessary in by far the greater proportion of towns; while for the two places we have mentioned, the results would, in all probability, have been better still if the strength of the sewage had been more concentrated. Agriculturally speaking, any dilution above 25 gals. per head of the population is not desirable, but is injurious and expensive to distribute; while, again, human faecal matter is too strong to be applied to land unless diluted in something like 10 gals. of water. The Chinese teach us an important lesson in this respect. They place all the solid matter, when they remove it from the towns, in small wells in their fields, and then take a scoopful and mix it in about ten or twelve times its volume of water before they apply it to their crops. If any one attempts utilizing sewage when mixed with rain-water, and has to pump the whole all the year through, he will find himself in endless difficulties.

Presuming, then, that we can arrive at a fixed quantity of 20 gals. per head of the population, or what may be taken as the dry-weather flow of the drainage from a town, the first step is to pass the whole through a strainer, so that all materials may be intercepted which will be likely to interfere with the pumping, or choke the smaller pipes used for irrigation. This is necessary, also, because in its unstrained state we cannot depend upon sewage going down and up again, and so passing over a valley, and the sphere of operations then becomes more limited.

Great part of the solid matter can also be removed by this process, and common house-ashes are the best mixing and deodorizing material to facilitate the stuff being carried away.

A piece of land should then be sought out, with a slope, if possible, of 1 ft. in 30 at least, and the filtered liquid, which will be full of strength, conveyed either by pumping or gravitation to the highest point of that land. Iron pipes should not be used, if possible; and when the land is very flat, it must be ridged and leveled. From the highest point of the land selected, the liquid must be conducted by open channels or through common drain-pipes laid on to the surface to all the different points where it is wished, and utilized for irrigation. The land adopted should be moderately porous, and then for every 100 people an acre may be allowed, but this varies much according to the nature of the soil. The land must be thoroughly drained and prepared. The best crops to be grown are Italian rye-grass, with alternately crops of vegetables, such as potatoes, cabbages, rhubarb, mangold. All these will luxuriate on the liquid, and we think we may safely say that the command of such liquid would be worth to any person from £5 to £10 an imperial acre, according to local circumstances.

Milch cows thrive remarkably well on this grass, and it has been proved by chemical analysis that the milk is of the best quality, while the vegetables are also quite wholesome.

Could such a system be carried out in the neighborhood of all our large towns, the results would be highly beneficial. The difficulties in the way, principally arising from ignorance on the subject, have been great; but to this system, or something like it, there can be no doubt, before many years, we must come, to prevent pollution of the rivers, and to make the most of the sources of fertility which are at our command, but which we are at present recklessly wasting. Many committees have been appointed by the house of commons to inquire and take evidence on this subject. In 1857 a commission was issued by the crown to certain gentlemen, at the head of whom was lord Essex, to inquire into "the best mode of distributing the sewage of towns, and applying it to beneficial and profitable uses." This commission went to work principally at Rugby, and made a vast number of experiments, the general result of which may be stated to be, that ordinarily diluted sewage may be said to produce such increased crops as to warrant an agriculturist in giving one halfpenny a ton for it, a ton of water containing 224 gallons.

The third report was issued in April, 1865, and the following recommendations are given as the results of their labors:

"1. The right way to dispose of town-sewage is to apply it continuously to land, and it is only by such application that the pollution of rivers can be avoided.

"2. The financial results of a continuous application of sewage to land differ under different local circumstances; first, because in some places irrigation can be effected by gravity, while in other places more or less pumping must be employed; secondly, because heavy soils (which in given localities may alone be available for the purpose) are less fit than light soils for continuous irrigation by sewage.

"3. Where local circumstances are favorable, and undue expenditure is avoided, towns may derive profit, more or less considerable, from applying their sewage in agriculture. Under opposite circumstances, there may not be a balance of profit; but even in such cases a rate in aid, required to cover any loss, needs not be of large amount. Finally, on the basis of the above conclusions, we further beg leave to express to your lordships that, in our judgment, the following two principles are established for legislative application: First, that wherever rivers are polluted by a discharge of town-sewage into them, the towns may reasonably be required to desist from causing that public nuisance. Second, that where town-populations are injured or endangered in health by a retention of cesspool-matter among them, the towns may reasonably be required to provide a system of sewers for its removal; and should the law as it stands be found insufficient to enable towns to take land for sewage-application, it would, in our opinion, be expedient that the legislature should give them powers for that purpose."

It is obvious, however, to any one perusing the above paragraphs, that they are exceedingly vague, and form but little guide to any one who must go into the question of whether money invested in utilization of sewage-schemes will pay an adequate return upon the outlay. The uncertainty attending the dilution of the sewage; the necessity of making the earth take it at all seasons; the distance that the liquid has to be pumped—have all been such difficulties in the way, that the commission could not well arrive at any other result than they have done.

Experience has now proved, what was formerly a matter of presumption, that, until we arrive at fixed quantities, no reliable principles can be laid down that would in all cases enable us to overcome the difficulties attending the sanitary management and utilization of sewage. See SANITARY SCIENCE.

SEWAGE, LIERNUR SYSTEM OF. The pneumatic system of Capt. Liernur for dealing with the sewage of a town has been in operation for some years on the continent; and Amsterdam, Leyden, Prague, Dordrecht, St. Petersburg, and some other towns, are now either partly or wholly drained on this plan. A town so drained is divided into districts of from 250 to 1000 acres, according to circumstances. Each of these districts is again divided into small sewage areas varying from 10 to 50 acres, also according to local circumstances. These small areas have each an air-tight cast-iron tank, from which extend along the several streets air-tight pipes of the same material, 5 in. in diameter, and independent of each other. The closets of the houses are connected by branches with these pipes.

An air-pump engine, or more usually two or three of these steam-engines, are placed in some central station, and in the under portion of the building air-tight iron reservoirs are situated, in which a vacuum of about $\frac{1}{4}$ atmospheric pressure is maintained. Pipes, also air-tight, and called central pipes, connect these reservoirs with the street tanks. Like the outer series, these are 5 in. in diameter, and each pipe has two connections with its street tank, by one of which only air can be sucked out; but the other dips into the well of the tank, thus enabling its contents to be removed by suction to one of the central reservoirs. When a vacuum is made in one of the street tanks, the contents of the closet pipes are drawn toward it; and on a second vacuum being created, the charge is drawn into it. This tank is then in due time emptied into a central reservoir by exhausting the air in the pipe connecting them.

We may state here that, although no water is used for flushing it is found that the fecal matter is reduced almost from the first to the consistency of thin pulp by the atmospheric pressure. Now as it is impossible to propel liquid any great distance along a horizontal tube simply by air-pressure—the air column always breaking through and destroying the vacuum—the pipes require to be set at inclines varying from 1 in 5 to 1 in 250 according to circumstances. This admits of a series of vertical risers being formed from which the liquid matter can never be altogether removed, and therefore these form a complete lock-off of one gradient from another, so that the vacuum cannot be destroyed. The residual liquid in these risers corresponds to the left quantity of water which a pump can never completely remove from a receptacle. When the apparatus is at rest, this minimum quantity of liquid matter arranges itself partly in the riser and partly in the lower end of the sloping pipe.

To show what takes place when there is a much larger amount of excreta to remove in one direction than in another, we may take the case of two branches from one main pipe each 100 ft. long, the gradient 1 in 100, and each having a riser of 1 foot. One of these pipes may have to deal with a single house producing only 1 ft. of fecal matter; the other may be connected with a barrack producing 100 times as much. "We have,

therefore, in the barrack pipe a mass filling both pipe and riser, and ready on the slightest force to discharge into the main or street pipe. On the other hand, in the branch pipe of the single family, there is the minimum quantity collected at the foot of the riser. The sucking action is now put in operation in the main pipe. The pressure of the atmosphere begins to act, and the barrack pipe rapidly discharges into the main pipe, while the smaller quantity is simply climbing up the riser, and before it has got to the top of the riser to be in a position to discharge, all the surplus quantity in the barrack pipe is gone, and that which is left is simply equal to that minimum which cannot be withdrawn. In this way the fullest pipe always begins to discharge first, the next more full waiting for it, and so on, until the minimum is reached, when simply air breaks through."

During the day the air-pumps maintain a vacuum in the central reservoirs and throughout the whole extent of the central pipes connected with them. Patrols of two men each visit the district tanks, one of whom, by opening a valve, makes a tank communicate with the central pipes, and so exhausts the air from it. He then shuts the valve, and the second man immediately opens another which allows the vacuum to act on one of the street pipes and its branches. A second, third, and fourth street pipe is dealt with in the same manner—the vacuum meanwhile being frequently renewed in the tank—till all the sewage in a district is collected and transferred to a central reservoir.

The pneumatic system of Liernur admits of ordinary water-closets being used. As, however, the water has afterward to be got rid of, he prefers, on the score of economy, a form of closet devised by himself which is used without water. It has no movable mechanism at all. The space into which the excreta falls is one arm of a short bent tube or siphon trap discharging into a soil-pipe. Each new deposit by its own weight forces out the former one, and there are special arrangements for the ventilation of the closet.

Capt. Liernur aims at making the sale of the fecal manure cover the working expenses of the system. The process, or at least one process, by which he converts the sewage material into a marketable manure, is as follows, leaving out some of the minor arrangements for saving heat. Mixed with a little sulphuric acid, it is placed in a large boiler through which pipes pass, and through these pipes waste steam, after being superheated, circulates, by which a rapid boiling takes place. The material is afterward transferred to a trough in which a long hollow drum of thin metal, heated internally, revolves. The drum takes up and dries a thin layer of the manure, which is scraped off by a fixed knife and sold under the name of *poudrette*. It contains from 7 to 10 per cent of ammonia, and it is affirmed that this method of converting the liquid manure into a dry powder is highly remunerative.

We need hardly explain that wherever the Liernur system is adopted, the mere water drainage such as that required for rain, waste water of houses, and the like, is provided for by separate drains formed of earthenware pipes, but of much smaller size than in cases where all kinds of sewage pass through them. Existing sewers in a town may of course be used for this purpose.

The details of the Liernur system have been so recently brought to much perfection, that we shall probably have to wait for some years yet before any decided opinion can be formed of its merits as compared with other methods of treating sewage. As yet no sanitary engineer has adopted it in England even on a small scale, but if it succeeds on the continent no doubt any existing prejudice against it will soon be overcome.

SEWAGE EARTH-CLOSET. In addition to the arrangements noticed under SEWAGE, and under SEWAGE, Liernur's System of, for getting rid of excreta, there is partially in use an *earth-closet*, in which the powerful deodorizing and other properties of dry earth are taken advantage of to deprive refuse of offense or harm, and to retain it in a fit condition for agricultural use. There are numerous forms of this kind of closet. Perhaps the simplest kind is that which consists of nothing more than a seat and a pan, the latter being lined round with earth by the help of a movable central mold or core. More convenient forms consist of a pail or a square-shaped pan on wheels under the seat, and an earth-box rising above it at the back. The box may be made to hold as much earth as serves for twenty or thirty sittings. By one of several devices in use, a valve is opened at the bottom of the earth-box, which allows the proper quantity of earth to descend through a spout and cover the deposit. The mechanism of one kind is such that the seat descends with the person, thereby bringing a charge of earth to the bottom of the spout, and when he rises it is dropped upon the feces.

The earth-closet system is, of course, scarcely practicable in large towns, as it would be very difficult to plan an economical arrangement by which the large quantities of earth required could be carried to and fro. But it is in use in many villages, and in some large isolated buildings, such as jails and hospitals. It has been much adopted in India, where, owing to the warmth of the climate, the rendering of fecal matter innocuous from the first must give it a peculiar advantage. It also appears to have been tried on a considerable scale in America; and a competent authority there reports that "experience has taught that its power for usefulness is restricted by the difficulties involved in procuring, preparing, and removing the dry earth required in its use, and

to some extent by those which attend, mechanically and chemically, the application of the earth to the dejecta.

SEWALL, MAY (WRIGHT), an educator, born in Milwaukee, Wis.; was educated at northwestern university and married, in 1880, Theodore F. Sewall. She became chairman of the executive committee of the National Woman Suffrage Association; was one of the World's Fair managers for Indiana in Chicago, 1893; has lectured on education, etc., and edited *The Historical Résumé of the World's Congress of Representative Women*.

SEWALL, SAMUEL, 1652-1730; b. England; came with his father to America at the age of nine; graduated at Harvard in 1671; preached for a short time; obtained great wealth by his marriage in 1677; went in 1688 to England; returned in 1689; in 1692 appointed one of the council, holding the office till 1725; was a judge, 1692-1718, when he was made chief-justice. Sharing in the general belief in Europe and America concerning witchcraft, he concurred in the condemnations in 1692; but in 1697 made a humble public acknowledgment of his error. He contributed liberally for the spread of the gospel among the Indians. In 1699 he was chosen one of the commissioners of the society in England for the propagation of the gospel in New England, and was their secretary and treasurer. He was for many years a member of the Old South church and held in high esteem. He published *Answer to Queries respecting America; Accomplishment of Prophecies; A Description of the New Heavens*. His diary and other papers are in possession of the Mass. historical society.

SEWALL, SAMUEL, LL.D., 1757-1814; b. Boston; great-grandson of the chief-justice and grandson of Joseph, D.D.; graduated at Harvard college, 1776; studied law and for many years practised in Marblehead. In 1800 he became judge of the supreme court, and in 1813 was made chief-justice.

SEWARD, a co. in s. w. Kansas, having the territorial line of Oklahoma territory for its s. boundary; 648 sq. m.; pop. '90, 1503, chiefly of American birth. It consists of a level fertile plain destitute of timber. Co. seat, Liberal.

SEWARD, a co. in s. e. Nebraska, drained by the Big Blue river, and its n., middle, and s. forks, on the Fremont, Elkhorn, and Missouri Valley, and the Burlington route railroads; 576 sq. m.; pop. '90, 16,140, chiefly of American birth. The surface is rolling. The soil is productive. Corn, wheat, and oats are the staples. Co. seat, Seward.

SEWARD, FREDERICK W., son of Wm. H.; b. N. Y., 1830; graduated at Union college, 1849; admitted to the bar, 1851; associate editor of *Albany Evening Journal* until 1861; assistant secretary of state, U. S., 1861-69, and again under the administration of President Hayes.

SEWARD, WILLIAM HENRY, an American statesman, was born in Florida, N. Y., May 16, 1801. He entered Union College at the age of fifteen, and graduated in 1820, having also spent six months of his senior year teaching in Georgia. In 1822 he was admitted to the bar, and settled in Auburn, N. Y. He soon distinguished himself in his profession, and acquired a high reputation for originality of thought and independence of action. It was about this time also that he became much interested in political affairs, and his first public work was an address in which he briefly outlined the history of the so-called "Albany regency"—a political clique who were exerting a most injurious influence in state affairs at this time. Seward made such an *exposé* of their machinery and intrigues, that it led to their final overthrow, in 1828. In 1830 he was elected to the State Senate by the anti-Masons, who at that time were a powerful majority in western New York. He was probably the youngest man ever elected to the Senate, not being quite thirty, but he soon became the leader of his party in that body, taking a prominent part in all the debates, especially those relating to internal improvements and the common school system. In 1833 he made a rapid tour through many countries in Europe, and during his absence wrote a series of some eighty letters, which were published anonymously in the *Albany Evening Journal*, and which added much to his reputation when their authorship became known. In 1834 he was a candidate for governor, but was defeated. About this time he received the lucrative appointment of agent of the Holland Land Company, which gave him wealth and influence. In 1838 he was elected governor by a large majority, and his administration was in many ways one of the most remarkable of any in the history of the state. Education, internal improvements, public works, reforms in the courts, banking, and militia systems, the extension of the franchise, and many other equally important were subjects to which he gave close attention during his term of office, while his messages to the Legislature are regarded as models of their kind, remarkable alike for their exalted views and their comprehensive grasp of the topics of the day. In 1843, declining renomination, he resumed his law practice in Auburn. In 1847 he was invited to speak in New York on the life and character of Daniel O'Connell, and this was, perhaps, one of the most brilliant oratorical efforts of his life. In 1849 he was elected to the U. S. Senate, and at once took a prominent position as the recognized leader of the Administration party. In 1850 he delivered his famous speech on the admission of California as a state, in which he made use of the expression "there is a higher law than the Constitution," that has since acquired so wide a fame. Another of his felicitous phrases, which is frequently quoted as giving character to the history of his time, is

from a speech in Rochester in 1858, in which he declared that there was "an irrepressible conflict between opposing and enduring forces," and that "the U. S. must become either entirely slave or entirely free." Beside his speeches on the compromises, he delivered many others on the commercial and industrial relations of the country, all of which are noticeable for their practical character, the variety and accuracy of statistics used, and the fervent love of country shown. Indeed, it is said that his speeches on the Tariff, Duties on Railroad Iron, American Whale Fisheries, Mail Steamers, and Internal Improvements, particularly, the Pacific railroad, were among the most powerful arguments made in behalf of those measures during the session. Another of the measures which met with his entire approval and support was the gratuitous distribution of public lands, since embodied in the "Homestead Bill." "A home," said he, "is the first necessity of every family; it is indispensable to the education and qualification of citizens." He was re-elected to the Senate in 1855, and the news of his re-election was received with demonstrations of rejoicing throughout the free states. In 1859 he revisited Europe, and extended his tour to Egypt and Palestine. In 1860 he was the most conspicuous candidate of the Republican party for the presidential nomination, receiving one hundred and seventy-three votes on the first ballot. He was defeated, however, by Mr. Lincoln, and he soon afterward canvassed the west in behalf of Mr. Lincoln, everywhere commending him as the safest man in the Union to whom to confide the cause of freedom against slavery. Then came the election, and Seward was made secretary of state, a position that he filled for eight years with an almost unparalleled industry, energy, and success. During this period he negotiated nearly forty treaties, most of them of historic importance. Of these there were three each with Great Britain, Italy, Mexico, and Peru. Without doubt, his finest acts of statesmanship were his management of the Trent affair; his dignified and determined action at the time of the French invasion of Mexico; and the purchase of the territory of Alaska, an act of judgment and foresight not fully appreciated by the public for many years.

On the 14th of April, 1865, as the war approached its termination, and while Seward was confined to his room by a fall from his carriage, President Lincoln was assassinated by John Wilkes Booth, an actor at a theatre in Washington. At the same time another assassin named Paine penetrated to the room of Mr. Seward, dangerously wounded his son, and with a poniard inflicted wounds upon him which were at first believed to be fatal, but from which he slowly recovered.

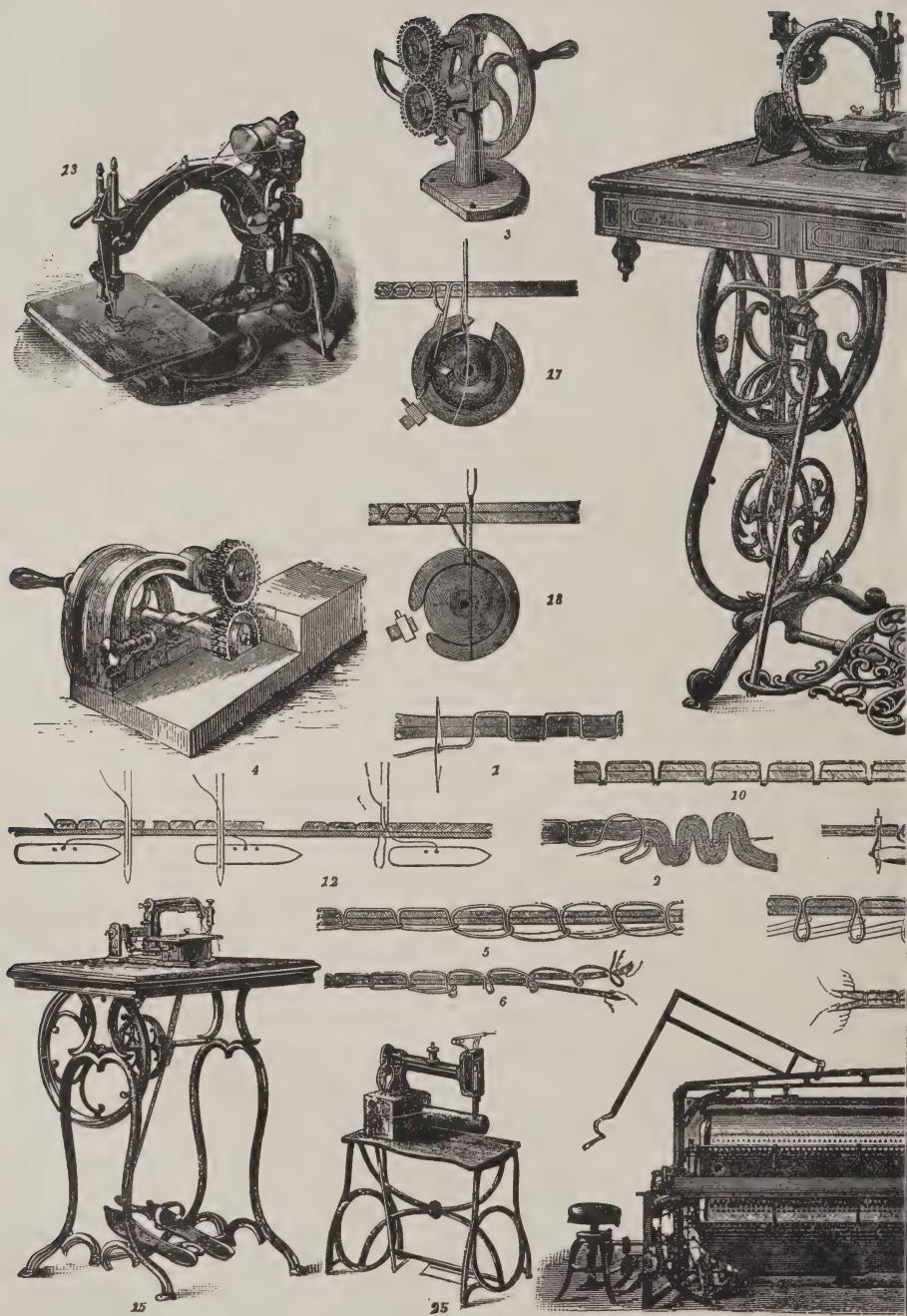
In 1869 he made an extended tour of California and Alaska, and in 1870-71 he made a journey around the world, and was received everywhere with distinction. He died in Auburn, Oct. 10, 1872. His speeches and orations are published in four volumes. He also wrote a *Life of John Quincy Adams* and a *Life of De Witt Clinton*. See Baker, *Life of William H. Seward*; Welles, *Lincoln and Seward*; Frederic W. Seward, *William H. Seward*, and *William H. Seward's Travels Around the World*, by his adopted daughter, Olive Risley Seward.

SEWELL, WILLIAM J., b. Ireland, 1835. He emigrated to the U. S., 1851; entered business in New York; went to sea for some years; and re-entered business life in Chicago. At the outbreak of the civil war he became capt. of the 5th N. J. vols., and at the close was a brevet maj.-gen. He was a member of the N. J. state senate for nine years, its pres. three years; and was elected, as a repub., to the U. S. senate, 1881.

SEWELLEL, *Aplodontia leporina*, Rich., an animal of the size and general appearance of the musk-rat, having the peculiarity of rootless molar teeth. It has a reddish-brown color, small eyes, short tail, strong jaws, and a plump body. It inhabits the n.w. coast of North America, particularly the region of Puget's sound. The natives use the skin as an article of dress. The animal lives in families or herds and makes extensive burrows.

SEWING-MACHINE, one of the most important inventions of this century. Like the stocking-frame, which in principle it closely resembles, we owe it to the ingenuity of a poor mechanic, striving to lessen the labor which he saw was a real hardship upon his wife and other poor women. Elias Howe, a native of Massachusetts, surrounded by a young family, for whom he was obliged to labor during the day, devoted his after-hours to the construction of a sewing-machine. This was about the year 1841, and his career since that period up to the present time forms a striking chapter in the annals of intelligent labor, and furnishes another proof of the saying that "fact is stranger than fiction." After incessant labor, during the latter part of which he and his family were indebted to a friend for the means of subsistence, he completed the first working sewing-machine, the patent for which was granted to him in May, 1841. He did not succeed in inducing the people of his own country to see the value of his patent, and went to England, where, after patenting it there also, he met with so much discouragement that he sold the patent for £250 and a royalty of £3 per machine to a staymaker, Mr. Thomas of Cheapside, London, who used it successfully in his own business, but did so little toward making it public that for several years its existence was only known to a very few individual manufacturers. When Howe reached his own country again, he found his American patent pirated by a wealthy company; but with admirable spirit he asserted his rights, and succeeded in establishing them; and it is gratifying to know that his talent, industry, and perseverance were rewarded, and he became a wealthy man.

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SEWING AND EMBROIDERY MACHINERY.—1, 2. Basting stitches. 3, 4. Basting machine. 5 machine. 9. Wilcox & Gibbs' single-thread chain-stitch machine. 10, 11. Two-three machine. 14. Machine for heavy work. 15, 16. Wheeler & Wilson's sewing mach 20. Hemmer. 21. Corder. 22, 23. Double-thread chain-stitch. 24. Grover & Bak 27. Heilmann's embroidering machine.



Single-thread chain-stitch; 7, formation thereof. 8. Heyer's (simplest form of) sewing machine. 12, its formation on bobbin machines. 13. "No-tension" s. 17, 18. Formation of stitches by Wheeler & Wilson machines. 19. Presser foot, sewing machine. 25. Shoemakers' sewing machine. 26. Automatic hand-machine.

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Howe's machine worked what is called the lock-stitch, but since his invention became known numerous improvements and modifications have been introduced by other inventors. The principal of these are as follows: 1. *Machines which sew with one thread*; of which one kind makes the *through-and-through* or *shoemaker's stitch*, the thread being held and pushed through with pincers, one pair on each side of the material to be sewn. The needle is pointed at each end, and being pushed through by the pincers on one side, is taken hold of by the corresponding pair on the other, and the thread is thus pulled through backwards and forwards. Only a small length of thread can be used by this machine, hence it is of but limited application. 2. Another single-thread machine makes the *running-stitch*. In this, the needle is stationary, and receives a continuous supply of thread from a reel; two small-toothed wheels are so arranged that their teeth, pressing into one another, crimp the two pieces of cloth, and push them forward against the point of the needle, which, as it gets filled, is relieved by the operator, who keeps drawing the sewn cloth off at the eye-end of the needle. This machine answers admirably in cases where loose tacking is required. It is the invention of an American of the name of Bostwick, who introduced it into England in 1844. 3. The *chain* or *tambour stitch* is also a single-thread stitch, the machine for which was invented by M. Thimmonier, a Frenchman, in 1848. In this, the thread is looped upon itself by means of a curved shuttle

after it has passed through the cloth. This kind of stitch, though very useful for some kinds of work, is easily pulled out. 4. Wheeler & Wilson's sewing-machine, another American invention, has acquired the greatest reputation in other countries. It is a double-thread machine, and besides the vertical eye-pointed needle, has a curved shuttle or hook (fig. 1, *a*) working below, with a revolving reel, *b*, inside its curve. The reel is of metal, each side being convex externally; and so adjusted on the axle, that the edges are so near together as to admit only one thickness of the thread to pass through (fig. 2). The side view of the whole

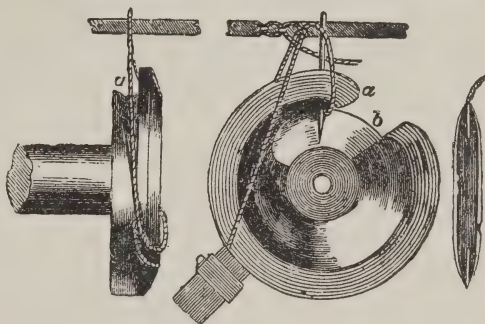


FIG. 3.

FIG. 1.

FIG. 2.

arrangement is seen in fig. 3. It fits easily within the nearly circular hook, and gives off its thread as required. The thread passes partly round the outer edge of the hook upon a slightly-grooved bevel (*a*, fig. 3), which forms a loop, and passes it between the needle and the thread which it carries with it in descending; the loop is held in position as the needle ascends, and the cloth being moved on, the next descent of the needle takes it through the loop and receives another below it, which renders the first one tightly locked. The lock stitch, the chain stitch, and the buttonhole stitch are the only stitches produced by machines. Among the prominent sewing-machines may be mentioned the Grover & Baker machine, the Singer machine, and the Wilcox & Gibbs machine. Sewing-machines have been patented in America and England by another American named Blake for sewing the soles on boots and shoes; and so rapid are they in their work, that it is said during the war in the United States as many as 150 pairs of soles have been sewed on army boots in one day by a single machine. Special sewing-machines are also in use for sewing the upper leathers of boots and shoes, for gloves, for embroidery, and various other purposes.

SEXAGESIMA SUNDAY (Lat. *sexagesima*, i.e., *dies*, the 60th day), the second Sunday before Lent, and roughly reckoned the 60th day before Easter.

SEXAGESIMAL, a mode of arithmetical calculation introduced by the ancient Greek astronomers, especially by Ptolemy (q.v.), into astronomical and geometrical reckoning. It was founded upon the division of the circle into 360 parts, and, the radius being nearly $\frac{1}{2}$ of the circumference, was considered to contain 60 of these parts or degrees. Continuing the same mode of subdivision, each degree (°) on the radius was divided into 60 minutes (′), each minute into 60 seconds (″), and thirds (″″), fourths (″″″), etc., followed in the same relation to each other. Addition and subtraction are not altered in this method, but multiplication, division, and the extraction of roots are so to a considerable extent. Multiplication, the most used of these three operations, was carried on in the descending scale, as in the following example, where $\lambda\alpha^{\circ}\delta^{\prime}\kappa^{\prime\prime}$ is to be multiplied by $\kappa\delta^{\circ}\iota\eta^{\prime}\nu\delta^{\prime\prime}$, or (substituting Arabic numerals) $81^{\circ}4^{\prime}27^{\prime\prime}$ by $29^{\circ}18^{\prime}54^{\prime\prime}$:

$$\begin{array}{r}
 31^{\circ} \quad 4^{\prime} \quad 27^{\prime\prime} \\
 29^{\circ} \quad 18^{\prime} \quad 54^{\prime\prime} \\
 \hline
 899^{\circ} \quad 116^{\prime} \quad 783^{\prime\prime} \\
 558^{\prime} \quad 72^{\prime\prime} \quad 486^{\prime\prime\prime} \\
 1674^{\prime} \quad 216^{\prime\prime} \quad 1458^{\prime\prime\prime} \\
 \hline
 899^{\circ} \quad 674^{\prime} \quad 2,529^{\prime\prime} \quad 702^{\prime\prime\prime} \quad 1458^{\prime\prime\prime\prime} = 910^{\circ} \quad 56^{\prime} \quad 21^{\prime\prime} \quad 6^{\prime\prime\prime} \quad 18^{\prime\prime\prime\prime}
 \end{array}$$

Here, each of the three numbers, 31, 4, 27, is multiplied by 29; the same three by 18, and the results placed in the line below, one step to the right; and again by 54, and the results placed another step to the right. This arrangement proceeds on the principle that the product of degrees by minutes gives minutes; of minutes by minutes, seconds; of minutes by seconds, thirds; and, in general, the denomination of a product is indicated by the sum of the marks superposed on the two factors. The columns are added and rearranged by reduction (q.v.). This system, though clumsy and intricate, was a great improvement, as regards facility and accuracy, on the former Greek method; and so much was it admired that succeeding geometers founded on it a complete system of general calculation, and a work on sexagesimal computation was written by Barlaam, who died in 1348. It is almost unnecessary to state that the terms minutes, seconds, thirds, etc., here employed only denote sixtieths, sixtieths of sixtieths, etc., and have no other signification; further, that the degrees, minutes, and seconds in the multiplier are, for the time being, merely abstract units and parts of units. The operation of modern arithmetic known as *duodecimal multiplication* is effected in the same way, the subdivisions being twelfths in place of sixtieths.

SEXTANT, an instrument for measuring the angular distance of objects by means of reflection. The principle of its construction depends upon the theorem, that *if a ray of light suffer double reflection, the angle between the original ray and its direction after the second reflection is double that of the angle made by the reflecting surfaces*. Thus let A and B (fig. 1) be two mirrors perpendicular to the same plane, and inclined to each other, and let SA be a ray of light, which falling upon A is reflected on B, and re-reflected in the direction BC, then ACB is the angle between the original and finally reflected rays, and ADB is the angle between the mirrors. Now, as the angle of reflection is equal to the angle of incidence $\angle SAF = \angle BAD$, and $\angle GBA = \angle DBC$; but $\angle EBC = \angle BAC + \angle BCA = (\angle BAD + \angle DAC) + \angle BCA = (\angle BAD + \angle SAF) + \angle BCA = 2 \angle BAD + \angle BCA$; and $\angle EBC$ also $= \angle EBD + \angle DBC = \angle EBD + \angle GBA = 2 \angle EBD = 2 \angle BAD + 2 \angle BDA$; therefore $\angle BCA = 2 \angle BDA$, which proves the truth of the theorem. The instrument of which this theorem is the principle is a brass sector of a circle in outline; the sector being the sixth part of a complete circle, for which reason the instrument is called a *sextant*. Fig. 2 shows the essentials of its construction; AMN is the sector whose curved side, MIN, is the sixth part of a circle; A is one mirror wholly silvered, placed perpendicular to the plane of the sector, and on, and in line with, the limb AI, which is movable round a joint at or near A; B is the other mirror, also perpendicular to the plane of the instrument, and silvered on the lower half only, the upper half being transparent; E is an eyelet-hole or small telescope. The graduation runs from N to M (on a slip of silver, platinum, or gold let into the rim), and is so adjusted that when the movable limb is drawn toward N till the mirrors A and B are parallel, the index, which is carried at the foot of the movable limb is opposite zero on the graduation. If we suppose that this zero-point is at N, it is evident that the angle between the mirrors is equal to the angle NAI; and again, if instead of graduating from 0° at N to 60° at M, which is the proper graduation for the sixth part of a circle, the graduation be made from 0° to 120° , that is, each half-degree being marked as a degree, and similarly of its aliquot parts, then the angle NAI, read off by the index at I, will show at once the angle between

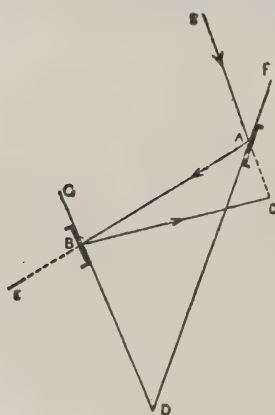


FIG. 1.

the incident and finally reflected rays. The mode of using the sextant consists in placing the eye to the telescope or eyelet hole, and observing one object directly through the unsilvered part of B, and then moving the index till the image of the other object, reflected from A upon the silvered part of B, coincides with, or is opposite to the first object, then the angle, read off at I, gives the angle between the objects. For additional accuracy, a vernier is attached to the foot of the movable limb.

The sextant is capable of very general application, but its chief use is on board ship to observe the altitude of the sun, the lunar distances, etc., in order to determine the latitude and longitude. For this purpose it is necessary to have stained glasses interposed between the mirrors A and B, to reduce the sun's brightness. These glasses (generally three in number) are hinged on the side AM, so that they may be interposed or not at pleasure. B is the glass through which the horizon is perceived, and has hence received the name of the *horizon-glass*; while the other mirror, from its being attached to the index-limb, is called the *index-glass*.

The sextant is liable to three chief errors of adjustment; 1° if the index-glass be not

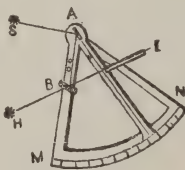


FIG. 2.

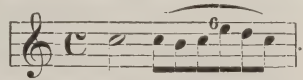
perpendicular to the plane of the instrument; 2° if the horizon-glass be not perpendicular to the plane of the instrument; and 3° if, when the mirrors are parallel (which is the case when a very distant body, such as the sun or moon, is observed directly through B, and found to coincide with its image in the lower part of B), the index does not point accurately to 0° ; this last is called the *index-error*, and is either allowed for, or is remedied by means of a screw, which moves the index in the limb AI, the latter being stationary. The first two errors are also frequently remedied by means of screws working against a spring, but in the best instruments the maker himself fixes the glasses in their proper position.—The *quadrant* differs from the sextant only in having its arc the fourth part of a circle, and being consequently graduated from 0° to 180° ; the *octant* contains 45° , and is graduated from 0° to 90° ; while the *repeating-circle*, which is a complete circle, is graduated from 0° to 720° . A common form of the sextant is the “snuff-box” sextant, which is circular in shape, and as it can be conveniently carried in the pocket, is the form most frequently used by land-surveyors.

The idea of a reflecting instrument, on the principle of the sextant, was first given by Hooke about 1666; but the first instrument deserving the name was invented by John Hadley (q.v.) early in the summer of 1730, and a second, and much improved form of it, was made by him a short afterward. Halley, at a meeting of the royal society, claimed for Newton the priority of invention; and in Oct., 1730, a Philadelphian, named Godfrey, also asserted his claim as the original inventor, but that learned body decided that Newton's claim was unsupported by even probable evidence, and that Hadley's and Godfrey's inventions were both original, but that the second form (which is almost the same as the common sextant now employed) of Hadley's instrument was far superior to his first form and to Godfrey's. See *illus., CIRCLE, ETC., vol. III.*

SEXTON (corrupted from SACRISTAN, q.v.), is a parochial officer in England, whose duty is to take care of the things belonging to divine worship. He is usually chosen by the inhabitants, but often also by the minister or the churchwardens, the mode of appointment being regulated by the custom of each parish. He sometimes also holds the office of parish-clerk. Women have occasionally been appointed sextons, this being one of the offices which women may fill, and they also have a vote in elections. The office is a freehold office for life, except in the new parishes under church-building acts; the duty is to keep the church clean, swept, and adorned; to open the pews; to make and fill up the graves; to prevent any disturbance in church. The salary is paid by the churchwardens, and as to amount depends on custom. In Scotland the beadle performs similar duties, and is appointed by the heritors.

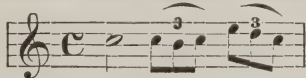
SEXTUPLET, in music. When a note is divided into six parts instead of the usual division into four—as, for instance, a minim into six quavers, or a crotchet into six semiquavers—the group is called a sextuplet, and the figure 6 is generally placed above it. The proper sextuplet is composed of three groups, of two notes each, being, in fact, a

triplet (q.v.), with each of its notes subdivided into two:



But a group composed of two successive triplets is sometimes, though not very correctly, also called a sextuplet and written as such, though it is more correct to divide it

into its component two triplets thus:



SEXTUS EMPIRICUS, lived in the first half of the 3d c., and connected himself with the school of the Empirics. He was a pupil of Herodotus of Tarsus who was probably contemporary with Galen. Nothing is known concerning his life, except that he was a physician, and of the school of the Empirics; but in his writings his philosophical opinions are sufficiently clear. His first work, the celebrated *Pyrrhonian Imaginations*, is a repository of the doctrines of the skeptics, his second, in 11 books, attempts to refute every item of positive knowledge that man has ever acquired. Both works combined furnish the best account extant of ancient skeptical thought and its methods of assailing all manner of opinions. Though occasionally sinking into mere dispute about words, Sextus generally hunts down with sharp and persevering pursuit every idea, real or supposed, and subjects it to skeptical distillations. Skepticism, he says, is the disposition to doubt of everything beyond mere phenomena, and he adheres rigidly to his definition. It surprises thinking men to find that the same problems which, 16 centuries ago, perplexed philosophers, are still tasking the brains and exciting the feelings of their successors, at the present day, and that essentially there is no new skepticism under the sun.

SEYCHELLES' COCOA-NUT, or DOUBLE COCOA-NUT, *Lodoicea seychellarum*, a palm, of which the fruit has some resemblance to a cocoa-nut, although it belongs to a different tribe of palms, being allied to the Palmyra palm. It is found only in the Seychelles islands; and the fruit, wafted by the winds to the shores of the Maldivé islands, or found floating in the Indian ocean, was long the subject of many ridiculous fables, and is still an object of interest and curiosity, and as such one of the minor articles of com-

merce. The tree grows to the height of 50 or 60 ft., with a tuft of immense leaves. The wood and the leaves are used for a variety of purposes, like those of other palms. The "cabbage" or terminal bud is eaten. The fruit is often a foot or a foot and a half long, in shape like a melon, its outer husk green, the interior near the base divided into two parts, at first filled with a white sweet jelly, which changes into a white horny kernel. The shells are used for making vessels of various kinds, often beautifully carved and ornamented.

SEYCHELLES ISLANDS, situated nearly in the center of the Indian ocean, between 3° 30'–5° 45' s. lat., and 55° 20'–56° 20' e. long., a group of more than 30 isles, resting on an extensive bank of sand and coral, and forming the most important of the dependencies to the colony of Mauritius. The principal are Mahé, Praslin, Silhouette, La Digue, Curieuse, St. Anne, Aux Cerfs, Frégate, Marianne, Longue, and Du Sud Est. Mahé, the most considerable and populous of the group, and the seat of government, is 16 m. long, and from 3 to 5 broad. The islands are mountainous, often rising abruptly from the sea, and are clothed with the most luxuriant verdure; one of the peaks, named Mont Blanc, in Mahé, attains an altitude of 3,240 feet. The principal port is Victoria, on the n.e. side of the island of Mahé, the houses of which used to be built chiefly of wood; but now coral is universally employed. Coral is growing very rapidly all round this group of islands. At fort Victoria, where the soundings were recently given at 7 fathoms, the coral has piled itself up to within 2½ fathoms of the surface. In the neighborhood of fort Victoria there is a beautiful church built of coral. Many improvements have been made also in others of these small islands.

The Seychelles islands were known to the early Portuguese navigators, who bestowed on them the titles of isles de Mascarenhas; subsequently the French renamed them îles la Bourdonnais, and finally changed their appellation in honor of the count Hérault de Seychelles. They were first settled by the French in 1756, who commenced the cultivation of spices, under circumstances so favorable as to induce a belief in a lucrative competition with the more easterly colonies of the Dutch. The immunity of the Seychelles islands from the hurricanes which periodically visit the neighboring seas rendered them peculiarly suited for this purpose, which, however, received a severe blow by the suicidal destruction of the spice-plants by the French occupants, to prevent their falling into the hands of the English in 1778. The cultivation is now checked by insufficiency of labor. On the cession of Mauritius the Seychelles islands were finally taken possession of by Great Britain. The islands produce a large quantity of timber suitable for ship-building purposes; and the Seychelles cocoa-nut, which is indigenous only in the Seychelles islands, and the nuts, leaves, etc., of which are applied to a great variety of domestic purposes by the natives. Sugar is cultivated to a small extent. Cotton flourishes here, but its cultivation has declined since the abolition of slavery. The chocolate plant and vanilla are grown, and tortoise-shell is among the articles of commerce. Area of group, 100 sq. m.; pop. '91, 16,440.

SEYFFARTH, GUSTAV, D.D., PH.D., b. Uebigau, Saxony, 1796; studied at Leipsic university, where he was professor extraordinary of archæology, 1826–55. Emigrating to America, he was professor in the Lutheran seminary in St. Louis, Mo., 1855–71. In 1857 he published at New York a *Summary of Recent Discoveries in Biblical Chronology, Universal History, and Egyptian Archæology*, in English and German. His works in German and Latin are very numerous. He d. 1885.

SEYMOUR, a city in Jackson co., Ind.; on the Baltimore and Ohio Southwestern, the Evansville and Richmond, and the Pittsburg, Cincinnati, Chicago, and St. Louis railroads; 59 miles s. of Indianapolis. It has flour, woolen, planing, and hominy mills, furniture and cigar factories, the machine shops of the Baltimore and Ohio Southwestern railroad, public library, high school, electric lights, national and state banks, and daily and weekly newspapers. Pop. '90, 5337.

SEYMOUR, FAMILY OF. This family, whose history is largely interwoven with that of England, was originally settled at St. Maur—whence its name—in Normandy. Coming over to England, the Seymours obtained lands in Monmouthshire as early as the beginning of the 13th century. They acquired estates at Hatch Beauchamp, Somersetshire, by marrying an heiress of the Beauchamps early in the 15th century. In 1497 we find the head of the family, sir John Seymour, employed in suppressing the insurrection of lord Audley and the Cornish rebels, and subsequently accompanying king Henry VIII. to his wars in France, and to the field of the cloth of gold. Of the issue of this worthy knight one daughter became the wife of Henry VIII., and mother of Edward VI.; one son, Thomas, created lord Seymour of Sudeley, became lord high admiral of England, and the second husband of Henry's widow (Catherine Parr), and ended his life on the scaffold, being attainted of high treason. Sir John's eldest son, Edward, who held many high positions in the court of Henry, was created lord Seymour of Hache, and duke of Somerset in 1546–47. He had been sent into France by Henry to settle the disputed question of the border of the English possessions there, and secured the confidence of the king so far that he was left by him one of his executors and one of the council of the young prince Edward. He was subsequently made lord high treasurer, and eventually "protector and governor of the King and his realms." (See EDWARD VI.) His subsequent fall, after a two years' tenure of his all but regal power by the influence of Dudley, earl of Warwick, and duke of Northumberland, was followed by an attainder of his honors, which was not reversed for more than a century.

The eldest son of the protector by his second marriage, being created by Elizabeth earl of Hertford, married the lady Catharine Grey, a grand-niece of Henry VIII., sister of the unfortunate lady Jane Grey—a marriage which entailed on him a long imprisonment and a heavy fine. His grandson, who succeeded him in the earldom of Hertford, was also sent to prison in the tower of London for marrying the lady Arabella Stuart, cousin of James I. of England; but subsequently, playing a conspicuous part in the royal cause in the civil wars, obtained in his own favor a reversal of his ancestor's attainder (see above), and in 1660 took his seat in the house of peers as second duke of Somerset, although the descendants of the first duke, by his first marriage, were then in existence. He died in 1675, and his ducal title passed to a cousin, on whose death it was inherited by Charles Seymour, known in history as the "proud duke of Somerset," a nobleman whose style of living was ostentatious and haughty in the extreme, and who filled several high posts in the courts of Charles II., William III., and Anne. He married the heiress of the Percies, by whom he had a son, Algernon, 7th duke, who was created earl of Northumberland, with remainder to his son-in-law, sir Hugh Smithson, the ancestor of the present Percy line. On the death of this duke a curious peerage case arose, the title being claimed by the descendants of the first duke by his first marriage, on the failure of the younger branch; and the attorney-general having reported in favor of the claim, sir Edward Seymour took his seat in the house of peers as 8th duke.

SEYMOUR, GEORGE FRANKLIN, b. New York, 1829; graduated at Columbia college, 1850, and at the general theological seminary, Protestant Episcopal, 1854; was a missionary at Dobbs' Ferry for several years; principal of St. Stephen's college, Annandale, 1860; pastor of St. John's church, Brooklyn, 1863; elected professor of church history in the general theological seminary; chosen bishop of Illinois in 1874, but failed of confirmation by the general convention; was chosen dean of the seminary in 1875, and bishop of Springfield, Ill., in 1878.

SEYMOUR, HORATIO, LL.D., b. N. Y., 1810; received an academic education, studied law, but did not practice. He devoted himself after 1832 to the settlement of the paternal estate; and in 1841 went to the state assembly, to which he was re-elected three times, being speaker in 1845. In 1852 he was elected governor of the state and again in 1862, and was earnest in employing his power and influence for the prosecution of the war for the union, and especially in suppressing the draft riots in 1863. In 1868 he received the nomination of the democratic party for the presidency, with Gen. Francis P. Blair, jr., as vice-president. The ticket was defeated by Grant and Colfax. Mr. Seymour then remained in retirement on his farm at Deerfield, N. Y., near Utica, although his name was prominently considered for the democratic nomination for president in 1880. He became president of the national dairymen's association, and of the prison association of the United States; he devoted much attention to agricultural questions, and frequently delivered addresses before agricultural bodies. His reputation was that of a profound statesman and astute politician. He d. 1886.

SEYMOUR, THOMAS DAY, born in Hudson, Ohio, in 1848, graduated from Western Reserve College in 1870; studied at Leipzig and Berlin, 1870-72; was professor of Greek at Western Reserve College from 1872 to 1880, when he was appointed to his present position of professor of Greek at Yale College. He is Chairman of the Managing Committee of the American School of Classical Study at Athens, an editor-in-chief of the College Series of Greek authors, and one of the American editors of the Classical Review. He has published *Selected Odes of Pindar* (1882); *Introduction to Homeric Languages and Verse* (1885); *Homer's Iliad, Books I-III* (1887); *Vocabulary to the first six books of the Iliad* (1889); *Homer's Iliad, Books IV-VI* (1890), and articles in various periodicals.

SEYMOUR, THOMAS HART, 1808-68; b. Conn.; studied at the military academy, Middletown, Conn.; practised law, and was made judge of probate. In 1837 he edited the *Jeffersonian*, a democratic newspaper; in 1843 was a member of congress; and on the breaking out of the Mexican war, volunteered and rose to be maj. and colonel. In 1850-53 he was governor of Connecticut; and 1853-57 minister to Russia.

SEYMOUR, TRUMAN, b. Vt., 1824; graduated at West Point, and served through the Florida and Mexican wars. He was under Maj. Anderson at Fort Sumter in 1861; afterwards commanded a brigade under Meade, led a division at the assault on Fort Wagner in 1863, commanded an expedition to Florida in 1864, and a division in the Richmond campaign. He was brevetted maj.-gen., U. S. army; retired, 1876. D. 1891.

SFORZA, a celebrated Italian family, which played a most important part in the affairs of Italy during the 15th and 16th centuries, swayed the destinies of northern Italy for many years, and allied itself with the first sovereign houses in Europe. Its founder was a peasant of Cotignola, in the Romagna, by name *Giacomo*, or *Muzio* (sometimes combined by historians into *Giacomuzzo*) *Attendolo* (born 1369), who deserted his trade of wood-cutting to become a "condottiere," and by his intelligence and courage rose to a high position in the band to which he belonged. Count Alberigo de Barbiano, the founder of Italian "condottierism," bestowed upon him, on account of his prowess, the name of *SFORZA* (Ital. "the forcer"); and such was his reputation among his comrades, that he speedily found himself the independent leader of a band of condottieri, and offered his services to the king of Naples. Queen Joanna II. made him constable of that kingdom, and in exercise of his office, he chased away the Aragonese, and

others, who attempted to deprive her of her dominions; but dying soon after (Jan. 4, 1424), he left his devoted followers to the chieftainship of his natural son, FRANCESCO SPORZA, then 23 years of age, who was as brave and enterprising as himself. Francesco, as was the custom of the time, sold his sword to the highest bidder, and without the slightest scruple fought for or against the pope, Milan, Venice, and Florence. He invented an improved system of tactics, and it soon came to be taken for granted that victory was certain for the party which he supported. It was thus no great act of condescension in the duke of Milan, the haughty Visconti, to confer upon him the hand of his daughter Bianca, with Cremona and Pontremoli as a dowry, and the promise of succeeding to the duchy itself. Meantime, Sforza took the march of Ancona from the pope (1434), added to it Pesaro (1443), and by a judicious combination of force and stratagem, obtained his elevation to the dukedom of Milan (Feb. 26, 1450), after the decease of his father-in-law. He solidly established his authority over all Lombardy, and several districts s. of the Po; acquired the esteem of Louis XI., who gave up to him Savona and Genoa; and after gaining the universal love of his subjects, died Mar. 8, 1466. Though uninstructed, he possessed considerable eloquence, and loved and protected letters. The successors to his power possessed few or none of his distinguished talents. His son, GALEAZZO MARIA SFORZA (1466-76) was a true tyrant, gloating over the torments of his victims, and a monster of debauchery, prodigality, and ferocity, without a single redeeming feature in his character. He was assassinated (Dec. 26) at the porch of the cathedral of Milan. His son GIOVANNI GALEAZZO SFORZA (1476-94) succeeded under the regency of his mother, Bona of Savoy, who held the reins of government with a firm hand. But she was forced to give up (1480) her able coadjutor, Simonetta, to the vengeance of her brother-in-law, Lodovico Maria, surnamed "the Moor," from his dark complexion; and three days after Simonetta's execution, the ambitious Lodovico banished herself, and assumed the regency. Finding the young duke in his way, Lodovico put him and his wife, Isabella of Calabria, in prison, and was immediately threatened with attack by the king of Naples, a danger which he attempted to ward off by giving his daughter, Bianca, with a dowry of 400,000 ducats, to the emperor Maximilian I., and by stirring up Charles VIII. of France to assert his claims to Naples. Soon afterward, duke Giovanni Galeazzo died, poisoned as some believe, by his uncle, Oct. 20, 1494. Lodovico MARIA (1494-1500) obtained his investiture as duke, and becoming alarmed at the rapid progress of the French in Italy, he joined the league against them, and was rewarded for his perfidy by being driven from his duchy, which was seized by the troops of Louis XII. (1499). The following year he made an ineffectual attempt to regain possession, was made prisoner, and carried to France, where he died about 1510. He possessed great talents, combined unfortunately with a low morality, which led him to value astuteness more than everything else; but his encouragement of letters and of the fine arts will preserve his name to posterity. His eldest son, MASSIMILIANO SFORZA (1512-15), regained the duchy of Milan after the reverses suffered by Louis XII., and with the aid of the Swiss steadily repulsed the various energetic attempts of the French to recover it; but after the battle of Marignan (1515), he abandoned his rights to the French for a pension of 30,000 ducats, glad to be free from the insolence and exactions of his allies, and the attacks of his enemies. His brother FRANCESCO MARIA SFORZA succeeded nominally to the Milanese after the battle of Pavia, but he was a mere puppet in the hands of Charles V., and on his death, Oct. 24, 1535, and the extinction of the main line of the house of Sforza, the duchy was quietly swallowed up by Austria. The lords of Pesaro (extinct in 1515), the counts of Santa-Fiora in Tuscany, still existing, and the dukes of Sforza-Cesarini, descend from collateral branches of the family.

SFORZA TO (Ital. forced), in music, often contracted *sf*, a term used to indicate that the note over or under which it is placed is to be played with strength and emphasis. A higher degree of emphasis is indicated by *sf*, or *sforzato assai*.

'SGRAVESAN DE, WILLEM JAKOB VAN, 1688-1742; b. Holland; educated at Leyden and Leipsic. In 1717 he was appointed professor of astronomy and mathematics, and in 1734 professor of philosophy, at the university of Leyden. His chief works are *Physices Elementa Mathematica* (1720); and *Philosophiæ Newtonianæ Institutiones* (1723).

SHACKELFORD, a co. in n.w. central Texas; drained by branches of Brazos river; 900 sq.m.; pop. '90, 2012, chiefly of American birth, with colored. The surface is mostly prairie land and adapted for grazing. Cattle are exported. Co. seat, Albany.

SHAD, *Alosa* or *Alosa*, a genus of fishes of the family *clupeide*, differing from *clupea* (the herring, etc.) in having the upper jaw deeply notched. The teeth are very small, on the jaws only, and often wanting, at least in the adult fish. The species are numerous, inhabiting the sea, but some of them ascending rivers like the salmon, and spawning there. They are very like herrings in form and appearance, and on this account, and their large size, the British species receive from Scottish fishermen the name of *king of the herrings*. The herrings of extraordinary size, of which the capture is sometimes reported, are probably always shad.—The COMMON SHAD, or ALLICE SHAD (*A. com muni*), is rather thicker and deeper in proportion to its length than the herring. It is found on the British coasts, and in the lower part of some of the large rivers, more abundantly in the Severn than in any other British river. It attains a length of two or even three feet, and a weight of from four to eight pounds. It has no teeth. There is

a single black spot behind the gills. Its flesh is of good flavor. The *TWAITE SHAD* (*A. finta*) is more plentiful on the British coasts, and is the common shad of the Thames, but the foul state of the river has now made it of very rare occurrence above London. It is smaller than the *Allice shad*, seldom exceeding 16 in. in length; there are small teeth in both jaws, and a row of dusky spots along each side of the body. The flesh is coarser, and less esteemed than that of the *Allice shad*, but much used for food wherever the fish is plentiful. This species spawns later in the year than the last, and in order to permit it to deposit its spawn, its capture in the Thames is prohibited after the end of June. It abounds in many of the rivers of France, and other parts of Europe.—A species of shad, generally weighing about four or five pounds, but sometimes twelve pounds, is very abundant during some months of the year in some of the North American rivers, as the Hudson, Delaware, Chesapeake, and St. Lawrence, and forms an important source of wealth.

The most generally esteemed species of shad are the *alosa vulgaris* and *alosa finta* of western Europe, the *alosa sapidissima* of the eastern United States, and the *alosa reevesii* of the Yang tse-Kiang in China. The American and Chinese species are held in the highest regard, the shad of the Connecticut river being the finest in America. They attain to the best condition, and sometimes weigh five or six pounds, the average being about four. The North river shad is somewhat smaller, and those of the Delaware, and rivers further south being rather smaller still. While in the sea shad are said to live chiefly on small crustaceans, but when ascending rivers they eat but little. For several years until recently the supply of shad decreased in most of our rivers, especially the Hudson; but they are said to have become more plentiful, owing to the efforts of the fish commissioners. They have been introduced into the Pacific rivers, and increased in the Mexican gulf waters. It has been attempted to introduce American shad into Germany, but not successfully, on account, it is said, of the shortness of the hatching period there.

SHADDOCK, *Citrus decumanus* (see CITRUS), a tree, which, like the other species of the same genus, is a native of the East Indies, and which has been long cultivated in the s. of Europe. It is said to derive its English name from a Capt. Shaddock, by whom it was introduced into the West Indies. It is readily distinguished from most of its congeners by its large leaves and broad-winged leaf-stalk; it has very large white flowers, and the fruit is also very large, sometimes weighing 10, or even 14 pounds, roundish, pale yellow; the rind thick, white and spongy within, bitter; the pulp greenish and watery, subacid, and sub-aromatic. It is a pleasant, cooling fruit, and much used for preserves. The tree is rather more tender than the orange, but with proper care is often made to produce fine fruit in orangeries.

SHADOW is a portion of space from which light is debarred by the interposition of an opaque body. If the luminous body be too near, or too large to be considered as a mere point, then each atom of the light-giving surface throws its own shadow independent of the others. We have thus in reality a multiplicity of shadows overlapping each other, and forming what in common parlance is "a" shadow of the opaque body, which is darkest at those places where all the separate shadows overlap each other, and becomes lighter as it gradually falls beyond the limits of more and more of these separate shadows. See PENUMBRA. The depth of a shadow depends from mere force of contrast on the intensity of the light around it; it also depends much on the nearness of the object, as compared with its size, to the surface upon which the shadow is thrown; for the rays of light, by their properties of reflection, refraction, and dispersion, tend to bend "round" the opaque object, and the increase of distance between an object and its shadow allows more scope for this action.

SHAD TREE, or SHAD BUSH. See JUNE-BERRY.

SHADWELL, THOMAS, a dramatic writer of some note in his day, though now only remembered as the "Mac-Flecknoe" of Dryden's satire, was b. in 1640 in Norfolk. He was educated for the law, but not finding it a pursuit to his mind, he deserted it, and, after an interval of foreign travel, betook himself seriously to literature. His first comedy of *The Sullen Lovers* (1668) had great success, and he continued from year to year to entertain the town with a succession of similar pieces, a complete edition of which was published after his death in 4 vols. 12mo. The immortality which these must have failed to achieve for him, he was fated to attain in a way somewhat less desirable. With Dryden he seems, in the earlier portion of his career, to have been on terms of friendly intimacy; but literary jealousies divided them, and the quondam friend became a favorite butt for the shafts of Dryden's deathless ridicule. Though his works—hasty and careless as they are—exhibit lively talent and considerable comic force, all that the literary world now knows of Shadwell is that "Shadwell never deviates into sense." It might a little console him, under the satire of his enemy, that he succeeded him in the post of poet-laureate, which in 1688 it became necessary for Dryden to resign. He did not long survive to enjoy it, however, as in 1692 he died, it is said of an overdose of laudanum, a drug in which he was wont to indulge himself.

SHAFITES, the name of one of the four principal sects of the Sunnites (q.v.), or "orthodox" Moslems. Its name it received from its founder, Abu Abdallah Moham-

med Ibn Idris, called Al-Shafei, from one of his ancestors who descended from Mohammed's grandfather.

SHAFT, the body of a column, extending between the base and capital. In Gothic architecture the term is applied to the small columns clustered round piers, or in the jambs of doors and windows. In the early styles the shafts are frequently of finer material than the pier, such as Purbeck marble, and polished and banded. In later examples the shaft is generally attached, and of the same piece as the pier. For illustration see COLUMN.

SHAFTESBURY, commonly called SHASTON, a very ancient town of England, and a municipal borough in Dorsetshire, 19 m. s.w. of Salisbury. It stands on the narrow ridge of a chalk hill, and commands extensive and beautiful views of the counties of Dorset, Somerset, and Wilts. There is some agricultural trade. The date of its foundation is unknown, but it seems to have been a Roman station. In the reign of Athelstan (924-940) it contained two mints and an abbey of Benedictine nuns. Here Canute the Great died in 1036. Pop. '91, 2122.

SHAFTESBURY, ANTHONY ASHLEY COOPER, Earl of, English statesman and philanthropist, is descended from a family intimately associated with the political history and literature of England. Sir John Cooper of Rockbourne, Hampshire, married Anne, daughter and sole heiress of sir Anthony Ashley of Wimborne, St. Giles, Dorsetshire, secretary-at-war in the reign of queen Elizabeth. Their eldest son, sir Anthony Ashley Cooper (born 1621), was actively engaged in public affairs during the civil wars. He first espoused the cause of royalty; he then became one of the most eminent of the parliamentary leaders in the council, and not the least active in the field. When he saw that the restoration was inevitable, he took so prominent a part in bringing back Charles II. that he was raised to the peerage as baron Ashley. He was a member of the justly infamous "Cabal" ministry, and was afterward appointed to be lord chancellor, with the earldom of Shaftesbury. He was the "Achitophel" of Dryden, by whom his character is drawn with as much truth as power. He hated a calm, lived all his life in intrigues, and in his 62d year his "fiery soul" wore out his small and fragile body. He will be honored for all time by men of English race and descent as the author of the habeas corpus act. He also first introduced a bill rendering the judges independent of the crown.—His grandson, ANTHONY COOPER, third earl (born 1671, died 1713), author of the *Characteristics*, the friend of Pope, and the other celebrities of the Augustan age, obtained from Voltaire the questionable praise of being the boldest of the English philosophers.—The sixth earl was for many years chairman of committees of the house of lords.

His son, ANTHONY ASHLEY COOPER, seventh earl of Shaftesbury, was b. in Grosvenor square, London, April 28, 1801. He was sent to Harrow, and thence to Christ Church, Oxford, where he obtained a first-class degree in classics in 1822. He represented the borough of Woodstock from 1826 to 1830; the county of Dorset (in which the family estates are situated) from 1831 to 1846; and the city of Bath from 1847 to 1851, when he succeeded to the earldom. During his long career in the lower house he held one or two subordinate posts. He is better known by his attempts to improve the social condition of the laboring classes. As he belonged to the conservative party, and represented an agricultural county, the manufacturers, and their organs in the press, received his allegations respecting the condition of their operatives in a hostile and antagonistic spirit, and retorted that the wages of families engaged in factories amounted to twice and three times the sum paid to the Dorsetshire laborers. Yet lord Ashley returned again and again to the charge; and on the death of Mr. Sadler, M.P., took charge of the ten hours' bill. The manufacturers declared with alarm that any reduction in the hours of labor would be fatal to our manufacturing supremacy. Successive governments naturally believed these prophecies, and almost all the leading statesmen of the day opposed the ten hours' bill. But public opinion declared in favor of a limitation of the hours of labor. Lord Ashley carried his bill through parliament, and has the satisfaction of knowing that the opponents of the measure admit, without an exception, that it was an act of wise and beneficent legislation, and that their alarms were groundless. When he visited the manufacturing districts, he was honored with an enthusiastic ovation. He refused to join sir R. Peel's administration in 1841 because that statesman refused to countenance the ten hours' bill. In 1846 he supported sir R. Peel in his proposal to repeal the corn laws, an act which cost him his seat for Dorsetshire. When he successfully contested Bath against Mr. Roebuck in 1847 he appeared on the field of politics as a "liberal conservative." After his accession to the earldom, Shaftesbury took a more prominent part in connection with various religious, social, and philanthropic societies. These are so numerous that a list of the associations with which he was in some way officially concerned, would include almost every scheme having for its object the physical, moral, and spiritual improvement of society. He belonged to the evangelical party in the church of England, and was a prominent member of the chief church societies. He was married to a daughter of the fifth earl Cowper, and being thus a connection by marriage of the late viscount Palmerston (whose government he steadily supported), many of the ecclesiastical appointments and promotions of evangelical clergymen made by that minister were attributed to his influence. He followed up

the ten hours' bill by obtaining the assent of parliament to other measures regulating defective workshops and factories, night-work, and the treatment of children by their employers. Among honors that were conferred on lord Shaftesbury are the Oxford degree of D.C.L. in 1841, and the honorary citizenship of Edinburgh in 1878. He d. 1885.

SHAG. See CORMORANT.

SHAGREEN is generally understood to mean shark skin dressed and rubbed down smooth or not; but the oriental shagreen, formerly in so much repute, consists of portions of the skins of horses, asses, camels, and oxen, the part used being strips taken from head to tail, along the center of the back. These strips are prepared by soaking in water, and currying; and when in the proper condition, they are laid on the ground, and the seeds of *chenopodium album* are sprinkled over them; a board or piece of felt is then placed on the seeds, and by pressure the hard seeds are forced deeply into the skin, which is then hung to dry. When dry, the seeds are removed by shaking, and the skin pared down with a proper knife nearly, but not quite as low, as the bottom of the depressions caused by the seeds. After this the skin is again soaked, and the parts compressed by the seeds now rise up and form elevations, which are increased by washing in a solution of salt. The last operation is dyeing them of various colors, green being the favorite one. Owing to the difference of texture produced by the operations of compressing by the seeds, paring, etc., the color is taken irregularly; and when dyed green, the material somewhat resembles malachite in appearance when dried and polished. It was at one time a very favorite material in its use for covering small cases and caskets of various kinds, especially spectacle-cases.

SHAH (Persian, *prince, king*), the general title of the supreme ruler in Persia, Afghanistan, and other countries of southern and central Asia. The sovereign, however, may, and frequently does, decline the title, assuming in its place that of *khan* (q.v.), an inferior and more common appellation. The same title can also be assumed by any of the shah's sons, and upon all the princes of the blood the cognomen *shah-zadeh* is bestowed.

SHAH-JEHAN, or "king of the world," the title assumed on his accession to the throne by Khorrum Shah, the third son of Selim Jehan-Ghir, and the fifth of the Mogul emperors of Delhi. He was during his father's reign employed in military expeditions against the Rajputs, the independent Mohammedan states of the Deccan, and the Afghan tribes around Candahar, in which he greatly distinguished himself by bravery and military skill; but on his return he was forced into rebellion (1623) by the intrigues of his enemies at court, and was still unreconciled to his father at the latter's death in 1627, when he was at once saluted as emperor by the nobles. At his accession the empire had reached the summit of its greatness, but the causes which lead to its rapid decline at the same time unmistakably showed themselves; the territory was too extensive for the system of government which was generally pursued by the Moguls; the discordant parts were unconnected by any bond of union; the supreme ruler was looked upon in many provinces as a mere tax-collector; and with the thus necessary absence of any spirit of loyalty, insurrections were frequent in all the provinces. The chief events of Shah-Jehan's reign were the war against the Deccan sovereignties, which resulted in the complete destruction of the kingdom of Ahmednuggur (1631), and the subjugation (1636) of those of Beejapur and Golconda; an indecisive contest against the Uzbeks of Balkh (1644-47); two unsuccessful attempts to recover Candahar from the Persians; and a second successful war, conducted by his third son, Aurungzebe, against the Deccan princes (1655). But in 1657 the emperor fell dangerously ill, and his four sons, who were ambitious of attaining supreme power, immediately commenced to dispute regarding the succession. See AURUNGZEBE. Ultimately Shah-Jehan was taken prisoner, and confined in the citadel of Agra till his death, Dec., 1666. Shah-Jehan united the voluptuous profligacy so common in eastern monarchs with great sagacity, and the strict administration of justice to Moslem and Hindu alike. In his later years he became avaricious, increased the taxes, and confiscated the property of his wealthier subjects on the slightest pretexts. The magnificence of his court was unequalled; the splendid "peacock throne" was constructed by his orders at a cost of about £7,000,000, and many magnificent public buildings executed under his direction remain as monuments of his greatness. Chief of these are the city of Shah-Jehanabad, and the superb mausoleum of Tajmahal (see AGRA). Yet so strict was his financial management that he left a well appointed army of 200,000, and a treasury containing £24,000,000, to his son Aurungzebe.

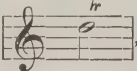
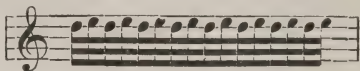
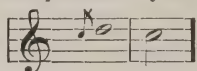
SHAHJEHANPORE, a t. of British India, the principal place of a district of the same name, N.W. Provinces. It stands on the Gurrâh, in lat. 27° 57' n., long. 79° 28' e. It has an export trade in cereals and sugar. Pop. '91, 78,552.

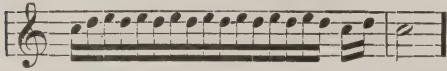
SHAH NAMEH, Book of Kings, the title of several eastern works, the most celebrated of which is the Persian poem of this name, by Firdusi (q.v.), containing the history of the ancient Persian kings in about 60,000 distichs, and written by the order of sultan Mahmud of Ghizni, in the space of thirty years. Another work, in Turkish, under the same name, comprises the history of all the ancient kings of the east, and was written by Firdusi Al-Tha'uil. Bajazet II., to whom the book was dedicated, ordered the author

to reduce it from its original bulk of 300 vols. to 80. Firdusi, however, felt so mortified at this proposal that he preferred leaving the country altogether, and emigrated to Khorassan, in Persia.

SHAIRP, JOHN CAMPBELL, LL.D.; b. Scotland, 1819; educated at Glasgow university and Balliol college, Oxford; was assistant master of Rugby school; professor at St. Andrews in 1861, and principal in 1868. Shairp published *Kilmahoe, a Highland Pastoral*; *Studies in Poetry and Philosophy*; *Lectures on Culture and Religion*; and contributed largely to periodicals. He d. 1885.

SHAKE, in music, an embellishment produced by the continued and rapid repetition of one note alternately with another either a whole tone or semitone above it. Its sign is *tr* (the first two letters of the Italian *trillo*), placed over or under the principal note.

For example:  is played thus: ; the exact number of repetitions being indefinite. A shake is often preceded by an appoggiatura (q.v.), and is very generally finished with a turn, as  played:

 We may have shakes on two notes at once; and a series of shakes on several notes is called a chain of shakes.

SHAKERS, the name commonly given to a small religious sect existing in the United States. The proper or official description of this sect is the United Society of Believers in Christ's Second Appearing; but its members seem to have accepted the designation of Shakers, though it was originally applied to them in ridicule, on account of certain rhythmical movements of the hands and arms which form part of the ceremonial of their worship. Though the Shaker societies are found only in the United States, their creed had an English origin. The founder of the sect, in whose person they believe that Christ has appeared a second time, was an Englishwoman, named Ann Lee, a native of Manchester, who emigrated to New York with a small band of disciples, shortly before the outbreak of the revolutionary war.

Ann Lee was the daughter of a blacksmith, who lived in Toad lane in Manchester; a very poor man, who gave her no education, and sent her while a mere child to work in a cotton-mill. She seems to have been a violent, hysterical girl, ambitious of notice, and fond of power, and to have always possessed, in virtue of her strong will and vehement temper, a great deal of influence over the people around her. She married while very young a blacksmith named Stanley. She had four children, all of whom died in infancy—to this, perhaps, may be ascribed the preference of the celibate to the married life, which she ultimately raised into a part of her religious system. She became one of the earliest believers in a prophetess, who appeared about 100 years ago, in the town of Bolton-on-the-Moors, in Lancashire—a poor woman, named Jane Wardlaw, the wife of a tailor, who believed she had “received a call” to go forth and testify for the truth. The burden of Jane Wardlaw’s message was, that the end of all things was at hand, that Christ was coming to reign upon the earth, and that his second appearance would be in the form of a woman, as prefigured in the Psalms. In subordination to this, she took up several of the tenets of the society of Friends, to which she and her husband originally belonged; especially, she raised her voice against war and against profane swearing. Her followers believed that she was filled with the Holy Spirit; they received her utterances as the voice of God; and she acted as if all the powers of earth and heaven had been given into her hands. Ann Lee on her conversion, began to preach the same message in Toad lane and the adjacent streets of Manchester; but she soon went beyond her teacher, and gained the leadership of her co-believers for herself. It happened that she was brought before a magistrate, charged with an obstruction of the streets, caused by the crowd collected to hear her preach, and she was sent to the Old Bailey prison in Manchester. When she came out of prison, she gave forth, that one night, a light had shone upon her in her cell; that the Lord Jesus stood before her; and that he became one with her in form and spirit. Her pretension was, that Christ was come to reign in her person. It was favorably entertained by the followers of Jane Wardlaw; and they acknowledged her as their head or mother, in place of Jane, whose pretensions had never gone so far. She found, however, that among her neighbors and fellow-workers, her claim to be the bride of the Lamb, the queen described by David in the Psalms, excited only jeering and ridicule, and she received a revelation that she should seek in America a home for herself and her few disciples—that it was in America that the foundations of Christ’s kingdom were to be laid. So she went to New York, accompanied by seven disciples—five males and two females. Her husband also went with her; but he seems to have had no faith in her, and he left her soon after their arrival, in consequence of one of the features then introduced into her system. This was the practice of celibacy, which she had not previously enforced upon her followers, though she had enjoined it as a duty. Her teaching was, that men

called into grace must live as the angels do, among whom there is no marrying or giving in marriage, that no form of earthly love could be allowed in the Redeemer's kingdom. Finding a populous city unfavorable to her designs, she removed, with her followers, first to Albany, then far into the wilderness to Niskenna, and there founded the settlement, which still exists, of Watervliet. It was in the spring of 1780—when she had been three years and a half at Niskenna, looking for new believers to come in, but making no attempt to win them—that the first American converts joined her society. A revival had taken place at Albany, and had spread through the surrounding districts; and from Hancock and New Lebanon a deputation was sent to Niskenna, to see what light its inhabitants enjoyed as to the way of salvation. The deputation consisted of Joseph Meacham and Lucy Wright—subsequently the heads of the Shaker society. These persons became believers in Ann Lee; and through their agency other converts were won, and a Shaker society established at New Lebanon. Toward the close of 1780, the revolutionary war being then in progress, notoriety was given to Ann Lee's pretensions, through an incident seemingly unfavorable. Owing to her British origin, her denunciations against war, and her refusal to take the colonial oaths, Ann was imprisoned for some time at Poughkeepsie, on suspicion of being a British spy. Before she was let out of prison, in December, 1780, all the colonies had heard of "the female Christ." In the following year, she started upon a missionary tour through New England and adjacent colonies; she found the people everywhere curious to see her, and she made not a few converts. She did not return to Watervliet till Sept., 1783; and about a year after, she died. Her death was a surprise to many of her followers, who believed that she was to live among them forever; but her successors—the Joseph Meacham and Lucy Wright already mentioned—to whom, on her death-bed, she had made over the headship of the society, were ready with a theory accounting for it. "Mother Ann," they said, could not die, and was not dead, and had not ceased to live among her people. She had only withdrawn from the common sight; she was still visible to eyes exalted by the gift of grace; she had cast the dress of flesh, and was now clothed with a glory which concealed her from the world. So it would be with every one of the saints in turn; but the spirit of those who "passed out of sight" would remain near and be in union with the visible body of believers. This explanation was generally accepted, and has become a vital part of the Shaker creed.

By Joseph Meacham and Lucy Wright, the successors of "Mother Ann," the Shakers were gathered into settlements, ten in number; and a covenant was drawn up embracing the chief points of their creed, and of the social system since associated with it. Their head was, of course, "Mother Ann"—that is, Christ—of whom Joseph and Lucy were temporarily the representatives; elders and deacons, male and female, were appointed; the institution of celibacy was confirmed; and a community of goods was introduced. On the death of Joseph Meacham in 1796, "Mother Lucy" became the sole head of the society, and she governed it with ample powers for 25 years. She named a female successor with the title of elderess; and the name of "mother" has not, since that time, been applied to the female head of the community. Eleven societies were formed between 1787 and 1792. Early in the present century a remarkable religious excitement took place in Kentucky. The Shakers, taking advantage of this movement, sent three representatives thither, and received sufficient additions to found five new societies. (See Nordoff's *Communitistic Societies of the United States*, 1875.) The Shakers were, at the census of 1890, about 2400 in number, included in 18 societies; of which three are in the state of New York, four in Massachusetts, two in New Hampshire, two in Maine, one in Connecticut, four in Ohio, and two in Kentucky. Their numbers have increased since 1870; the influence of their opinions has extended; and the 18 separate settlements continue to form a united and peaceful society.

Their doctrine has been to some extent developed as well as systematized since the death of "Mother Ann." They believe that the kingdom of heaven has come; that Christ has come upon earth a second time, in the form of "Mother Ann," and that the personal rule of God has been restored. Then they hold that the old law has been abolished, and a new dispensation begun; that Adam's sin has been atoned; that man has been made free of all errors except his own; that the curse has been taken away from labor; that the earth and all that is on it will be redeemed. Believers, on going "into union," die to the world, and enter upon a new life, which is not a mere change of life, but a new order of being. For them, there is neither death nor marriage; what seems death is only a change of form, a transfiguration which does not hide them from the purified eyes of the saints; and in union, as in heaven, there is no marrying or giving in marriage—the believer owes love to all the saints, but his love must be celibate in spirit and in fact. The believer, living in union, *is* in heaven. The Shakers believe that the earth, now freed from the curse of Adam, is heaven; they look for no resurrection besides that involved in living with them in "resurrection order." The believer, upon entering into union, leaves behind all his earthly relationships and interests, just as if he had been severed from them by death. And since to be in union is heaven, the Shakers hold that no attempts should be made by them to draw men into union: God, they say, will draw to them those whom he has chosen at his own time. Those who have "passed out of sight" are still in union; and the Shakers live in daily communion with the spirits of the departed believers. The belief in a communion with angels and

spirits is no mere theory; it has a most important influence upon their lives; they profess to be more familiar with the dead than with the living. It being the work of the saints to redeem the earth from the effects of the curse, labor is a sacred and priestly function, especially when bestowed in making the earth yield her increase, and in developing her beauty. It should be done in a spirit of love; the earth, they say, yields most to those who love it; and love and labor will in time restore it to its primitive state. According to Mr. Dixon, they bestow upon their gardens and fields the affections which other men bestow upon family or worldly goods. Their country they regard only as it is a part of the earth, which they love, and as the favored land in which God's kingdom is first to be established. In its politics and its fortunes, they take no interest; and, indeed, their whole system is a protest against the existing constitution of society, as well as against the ordinary lives of men. Consistently with their belief in the second appearance of Christ in the form of a woman, the Shakers seem to believe that there is a female as well as a male essence in the Godhead—in the motherhood as well as the fatherhood of God.

A Shaker settlement is, for convenience, divided into families, consisting of the brothers and sisters, who live in the same houses, each governed by an elder and an elderess. There are two orders of members, probationers and covenanters—that is, novices and full members. It is on becoming a covenanter that the Shaker puts his property into the common stock. On entering upon residence, he becomes subject to all the rules of the society; but he is free—whether a covenanter or a probationer—to leave the body whenever he pleases. Both men and women wear a prescribed dress. The men wear a sort of Arab sack, with a linen collar and no tie; an under-vest buttoned to the throat, and falling below the thighs; loose trousers, rather short; and a broad-brimmed hat, usually of straw. The women wear a small muslin cap, a white kerchief round the chest and shoulders, a skirt dropping in a straight line from the waist to the ankle, white socks, and shoes. Some latitude is allowed as to the materials of the dress. Men and women, it is said, have the look of persons at peace with earth and heaven. "Apart from a costume," says Mr. Hepworth Dixon, "neither rich in color nor comely in make, the sisters have an air of sweetness and repose, which falls upon the spirit like music shaken out from our village bells." [*New America*, by W. Hepworth Dixon (Lond. 1867), from which the materials of this sketch have in a great measure been derived.] All labor with their hands, both men and women; but the latter do only indoor work. Every man, whatever his rank in the church, follows some manual occupation, and most of them have more than one. Working not for gain, but with loving care, and with the sense that they are exercising a priestly function, the Shakers are unrivaled among their neighbors in the arts to which they apply themselves, especially the culture of their land, and the production of fruits and flowers. They pay great attention to ventilation and to all sanitary conditions; they live almost entirely upon the produce of the soil, and drink only water; they employ no doctors and take no drugs, and are, nevertheless, among the healthiest of communities. Their society is recruited mostly by young men and girls; but, occasionally, married persons with their children come "into union," and make, it is said, "very pretty Shakers." Husbands and wives, when they have come "into union," become as brothers and sisters: it would be thought a weakness, says Mr. Dixon, and almost a sin, for them to feel any personal happiness in each other's company—they live for God alone, and their love ought to be shed on all the saints alike. The education of the children attached to the society is the work of the sisters, and they do it exceedingly well. The brothers and sisters take their meals in a common room, eating at six in the morning, at noon, and at six in the afternoon. Their meals are taken in silence, any direction that has to be given being given by a gesture or in a whisper. In their church-service, music bears a prominent part: the hymns and chants which are used being all of Shaker origin, communicated to believers in dreams and reveries by the spirits with whom they have communion. They have an extensive doctrinal literature.

SHAKESPEARE, WILLIAM, the chief literary glory of England, was b. at Stratford-on-Avon, in Warwickshire, it is believed, April 23, 1564. Certain it is, as vouched by the parish register, that his baptism took place three days after, on the 26th. His father, John Shakespeare, seems to have belonged by birth to the class of yeomen. His mother, Mary Arden, was of more distinguished origin. She came of a good old Warwickshire family; and when married, she brought to her husband as dower a property called Asbies, 54 acres in extent, besides an interest in certain other lands at Wilmeccote, and a small sum of money. In a contemporary document, John Shakespeare is described as a *glover*; and this trade, at that time a more important one than it has since become, there is evidence to show that he conjoined with that of a farmer and rearer of stock. His earlier career was one of steady prosperity, and the consideration in which he came to be held as a citizen is shown in the fact of his having in 1569 been elected chief magistrate of Stratford. Of a family of four sons and four daughters born to him, William was the third child. At the free grammar-school of Stratford there can be no doubt the young Shakespeare received his entire education. As to the precise character and amount of this, there has been much controversial conjecture; some writers maintaining, on the internal evidence of his works, that he must have enjoyed a thorough classical

training, while others represent him as probably destitute of any such youthful advantage. The celebrated "And though thou hadst small Latin and less Greek" of his friend Ben Jonson, which has been frequently quoted as certifying his almost utter ignorance, seems, if anything, to tell the other way. It assures us that, of both languages, he knew something; as to *how much* of either he may have known, it affords us scarce a ray of light, inasmuch as it is impossible for us even to guess at the amount of classical attainment sufficient, in the eyes of a scholar, and something of a pedant, like Jonson, to entitle a man to the praise of having *much* Latin and Greek. What Ben might contemptuously style "small Latin" was, in all probability, as it seems to us, a fair working allowance of it.

Meantime, misfortune had overtaken, and more and more come to press heavily on John Shakespeare; in consequence of which, William, now somewhat over 14, was withdrawn from school, and set to do something for his living. How he was employed from this time till his departure for London, it is impossible to make out with distinctness. One tradition informs us that, for a time, he served as apprentice to a butcher; and it is said that "when he killed a calf," the poetry of his nature prompted him to ennoble the operation as he could to himself, by "doing it in a high style, and making a speech." Unhappily, none of his speeches have come down to us, so that rather more of a mythical atmosphere than might be wished surrounds this pursuit of the ideal under difficulties. But that he was for some time a butcher's assistant, is as likely to be true as not. Another story has it, that for some years he was a school-master; whether or not in birching his boys he dignified the act as in the calf's case, tradition has omitted to inform us. Both stories are not unlikely to be true; the fact of the matter probably was, that in those years young Shakespeare lived miscellaneous as he could. Out of the cloud of uncertainty which shrouds this period of his life, two facts, however, emerge as beyond question—his marriage, and the birth of his eldest born. As soon as may be after Nov. 28, 1582—on which day the license was procured at Worcester—Shakespeare, a lively lad going 19, was married to Anne Hathaway of Shottery, a hamlet some mile or so out of Stratford, a damsel about eight years older than himself; and six months afterward a daughter was born to him, whose baptism bears record May 26, 1583. The obvious inference from this promptitude on the part of his spouse certain of his admirers have sought to evade. It is said, and we believe it is certain, that a mere betrothal before witnesses, to be followed within some reasonable undefined period by the religious ceremony, was then and there held to constitute a valid marriage; and this, it is conjectured, may in Shakespeare's case have prefaced the more formal sanction. And of course it may; the license of conjecture is unlimited; and all to whose comfort in admiring a great genius it is essential to regard him at every point of his career as also a pattern of everything that is proper, must of course be made welcome to this one. The only other children born of the marriage were twins, a boy and a girl, baptized Feb. 2, 1585. The boy (Hamnet) did not survive his father, dying in his 12th year.

As nearly as can be made out, in the year 1586, Shakespeare, then 22, left the neighborhood of Stratford, and betook himself to London. A local tradition assigns as his reason for doing so a mishap which befell him, and a little imprudence consequent on it. The future poet, it is said, while out on a nocturnal poaching expedition in the deer-park of a neighboring magnate, sir Thomas Lucy of Charlecote, was caught by the keepers, kept for the night a prisoner, and arraigned before sir Thomas—a justice of peace—in the morning. What passed is not recorded; but—as the old rumor goes—whatever it was, it excited the ire of Shakespeare, who avenged himself, as a bard naturally might, by circulating "a bitter ballad" in which the good knight was satirized. A further prosecution was for this irreverence directed against him, to escape which it was that he is said to have fled to London. No anecdote concerning Shakespeare has been more widely accepted than this, or, on the whole, seems better to deserve acceptance. An obvious allusion to the Lucies of Charlecote in the *Merry Wives of Windsor*, which identifies their coat of arms with that of justice Shallow, would of itself afford strong confirmation of it. Further, Oldys, an antiquary who died in 1761, and had busied himself much about materials for a life of Shakespeare, certifies the story on something like fair evidence, and gives the first verse of the obnoxious pasquinade, as remembered in the district. It is more coarse and scurrilous than witty; but inasmuch as it would be easy to adduce passages from the admitted writings of Shakespeare in which the coarseness to at least an equal extent preponderates over the wit, this will scarcely of itself amount to proof that he could not possibly have been its perpetrator. The indisposition which more lately has been shown to attach any credit to the tale, seems to rest entirely on a foolish horror of admitting anything as possible in the conduct of the poet which might any way seem to conflict with the reverence now universally accorded to his genius.

No certain details have come down to us as to Shakespeare's earlier relations with the London theater. According to one tradition, he was content at first to turn a penny by holding horses at the door. According to another—which seems in a natural sequence with the foregoing—we find him admitted inside on his promotion, though as yet only in the humble capacity of prompter's attendant. What is certain in the matter is this, that if at any time he was thus meanly occupied, it could have been only for a brief period, as very speedily we have note of him as a man of some importance, at once

dramatist, actor, and shareholder in the Blackfriars theater. As an actor—though we find one contemporary allusion to him as “excellent in the quality he professes”—he seems at no time to have shone especially, being rather respectable than eminent. As dramatist, his magnificent powers were at once recognized, and in no long time had won for him the very foremost rank among the writers for the stage of his time. The extraordinary rapidity of his rise is shown in this indubitable reference to him in Spenser's *Tears of the Muses*, published as early as 1591, only some five years after Shakespeare's arrival in London:

And he, the man whom Nature's self had made
To mock herself, and truth to imitate,
With kindly counter under mimic shade,
Our pleasant Willy, ah, is dead of late.

The reference here has indeed been surmised to point at sir Philip Sidney, by Spenser elsewhere alluded to under the figure of Willy a shepherd; but the surmise is, on various grounds inadmissible. The first two lines have the closest critical pertinence to the character of Shakespeare's genius; as applied to that of Sidney, they are, by comparison, vague and unmeaning. Further, the “mimic shade” in the third line, together with the whole context of the passage, makes it certain a dramatic writer is alluded to; and this Sidney was not. Moreover, the stanza which follows, wherein of “that same gentle spirit” it is said that he

Doth rather choose to sit in idle cell,
Than so himself to mockery to sell,

must needs be held to indicate a man at the time living; and Sidney had died in 1586. The “Ah, is dead of late!” which, literally taken, would suit Sidney, and not Shakespeare, must, in the light of the succeeding couplet, be interpreted as referring to some temporary remission on the part of the latter of his wonted dramatic productiveness; and this, if not otherwise to be accounted for, we might explain by supposing him at this time engaged on his two elaborate poems, *Venus and Adonis*, and *The Rape of Lucrece*, published not long afterward. The year after (1592), we find a contemporary and brother dramatist, Henry Chettle, making the *amende* to Shakespeare for an offense given, in terms most respectfully appreciatory of his excellences at once as a man and an author; and in 1598, Francis Meres, in his *Wit's Treasury*, writes of him as admittedly the “most excellent among the English for both kinds of tragedy and comedy.” We have ample evidence besides of the unrivaled acceptance his works obtained from all classes; not only were they in the wider sense popular, but they brought him special marks of favor and approval from queen Elizabeth and her successor, James—who is said to have honored the poet with an “amicable letter” from his own hand—and procured him the patronage and friendship of some of the most accomplished men of rank of the time, more notably, Henry Wriothesley, earl of Southampton, to whom he dedicated his *Venus and Adonis*, and *Rape of Lucrece*; and William Herbert, earl of Pembroke, commonly held to be the “Mr. W. H.” to whom, as their “only begetter,” his *Sonnets* are addressed.

Shakespeare was plainly—as men of consummate genius mostly are—a man of shrewd solid business ability; and throughout, his material prosperity kept pace with the growth of his poetical reputation. He became early, as we saw, a considerable shareholder in the Blackfriars theater. In the Globe, subsequently erected, he was also a part proprietor. To both he contributed dramas, and from his gains in the triple capacity of actor, author, and sharer of the general profits, he rapidly amassed a fortune. His local attachments were strong, and it seems to have become, as his wealth increased, one main object of his ambition to settle himself as a substantial country gentleman in his native district, to which annually he made a visit. We find him, with this view, from time to time making purchases there of house and landed property. By and by, his visits to Stratford became more and more frequent; and it is positively certain that previous to the year 1613, he had ceased to reside in London, and finally established himself at Stratford. Of his last years there spent, further than that they lapsed peacefully in honor, and the exercise of a liberal and kindly hospitality, nearly nothing is known. There is evidence of his having more or less occupied himself in agricultural pursuits, and good reason to believe that, though withdrawn from other active concernment with the stage, he still continued to write for it. His death took place on his 53d birthday, the 23d of April, 1616. In the diary of a Mr. Ward, the vicar of Stratford, writing circa 1660, the cause of it is thus given: “Shakespeare, Drayton, and Ben Jonson had a merry meeting, and, it seems, drank too hard, for Shakespeare died of a fever then contracted;” but that of this drinking the poet's death was a consequence is at best a doubtful inference.

That Shakespeare erred and sinned at times like others, we know from the passionate confessions of his *Sonnets*, in considerable portions of which the self-reference is too plain to be denied; that, whatever his occasional frailties, he was essentially a man of noble and estimable character, there is a complete concurrence of testimony. He was obviously of most kindly and lovable dispositions; his “pleasurable wit and good nature” made him delightful as a companion; and it was as “gentle Will Shakespeare” that he was familiarly known to his contemporaries. In particular, with his associates and rivals in writing for the stage, his relations would seem to have been of the most cordial and

even endearing kind. The gruff Ben Jonson writes of him after his death: "he was honest, and of an open and free nature," assures us that in "his well-turned and true-filed lines" we see but an authentic reflex of his beautiful "mind and manners;" and avers that he "honors his memory only on this side idolatry." As a slight shadow on this pleasing picture, it has been shrewdly surmised that he was not very happy with his wife. Evidence of this has been sought in certain passages in his dramas; but obviously any inference from these is most precarious. The neglect of her in his will, except in one curt clause interlined, dismissing her with a legacy of "his second-best bed," might well seem much more decisive, till Mr. Charles Knight greatly reduced its importance by showing that, the will apart, by the mere operation of the English law, the poet's widow was entitled to *dower*, and thus amply provided for. There is thus (though the query of why *second-best*, if a bed at all was to be left her, may perhaps have a certain pertinence) no very firm basis of proof for the domestic unhappiness of Shakespeare. Still, if anything in his life is certain, it is this, that, spending great part of his time in London, the poet did not find it essential to his felicity there to have the society of his wife; as probably she, on the other hand, though her husband had gone to the metropolis, was content to abide in Stratford, since it seemed to him the desirable arrangement. It is fair, we think, to infer from this that the affection subsisting between the two was a little on the hither side of enthusiasm.

To discourse here at this date of the genius of Shakespeare would be only to promulgate platitudes. The lofty eulogy of Dryden—"He was the man who, of all modern and perhaps ancient poets, had the largest and most comprehensive soul"—has since been generally acquiesced in. As dramatist, he is admittedly in the world without a peer; as poet (abstracting the differential forms), there are but one or two names in literature even to be named beside his; and dismissing his claims in either kind, we have in his works such a treasury of gnomic wisdom on all matters of human concernment as no other writer has ever bequeathed to the world. If we add, that this greatest of writers is one of the most unequal—that his works contain more than might be wished of what, as the product of such a mind, we need not scruple to call rubbish—and that nearly every vice in writing might be illustrated from them almost at will, we say simply what is patent to every reader not blinded by the stupid and mindless idolatry which too often of late in many quarters has displaced a rational admiration.

The only works of Shakespeare certainly published under his own hand were the two poems *Venus and Adonis* and *The Rape of Lucrece*, which appeared in 1593-94 respectively. As was naturally to be looked for in the case of pieces on the stage so popular, certain of his dramas found their way from time to time into print, but no authoritative edition of any of them was issued during his lifetime. The first collected edition of his dramas was issued in 1623, by Heminge and Condell, his friends and co-proprietors in the Blackfriars and Globe theaters. A second edition followed in 1632; a third, in 1664; and a fourth in 1685. In 1709 appeared the edition of Rowe, with a prefatory sketch of the poet's life. Of the "Shakespearian literature" which followed, and the various re-issues of the dramas, with such masses of critical commentary and emendation as no other writer has ever perhaps been made the subject of, it would be hopeless to attempt an account. It must suffice to mention as successive editors Pope, Theobald, sir Thomas Hanmer, Warburton, Capell, Stevens, Malone, and Dr. Johnson, whose elaborate introductory essay—whatever may be thought of the insolence of much of his criticism of the plays in detail—is perhaps on the whole, as an estimate of the genius of the poet, as satisfactory as any that has since been written. Down to our own time, there has been no remission of activity in this field of literary labor. More recently, the intelligent industry of Mr. Charles Knight specially deserves mention; and along with his may be given the names of Mr. Dyce, Mr. John Payne Collier, and Mr. Singer—all of whom have put forth elaborate and valuable editions of the dramas. An important edition was issued from Cambridge in 1863-66, under the superintendence of two gentlemen of unquestioned scholarly competence, W. G. Clark and W. Aldis Wright.

In Germany, Shakespeare has long been thoroughly naturalized; and the German enthusiasm in regard of him is, if possible, even greater than our own. It was the celebrated Lessing who first decisively introduced him to notice in a series of essays, exhibiting the immeasurable superiority of his art to that of the pseudo-classical models of the French stage. Since his time, many of the most gifted of his countrymen have devoted themselves to the work of Shakespearian criticism and elucidation. From Goethe we have some exquisite fragments, most notably the criticism of *Hamlet*, occurring in his *Wilhelm Meister*; and after his, the names of Tieck, A. W. Schlegel (whose *Lectures*, of date 1809-1811, almost constitute an era in this special department of literature), Franz Horn, and Gervinus (an English translation of whose elaborate commentaries has been published), occur as the most illustrious in connection with the present topic. By Tieck and Schlegel together, the work of translation was undertaken; and the result of their joint labors, which takes rank as the standard German Shakespeare, ranks also, in the opinion of competent judges, as a consummate and almost *unique* specimen of excellence in the translator's art. It has not unfrequently been alleged that, till the Germans made the discovery for them, the English people knew nothing of the greatness of Shakespeare. This is on the face of it ridiculous. The single sentence we have cited from Dryden, and the practical acceptance of it implied in the unexampled attention and industry

which never ceased to be directed to the subject, sufficiently of themselves confute so idle a notion. What the Germans really did (and along with their services in the matter, must be included those of our countrymen Coleridge, whose impulse and point of view, at least, if not something considerably more, were derived from German sources) was somewhat to methodize and enlighten for us an admiration never deficient, but always, like Jonson's regard for the memory of his friend, "only on this side idolatry." The old notion of Shakespeare was that of a genius in power and plenitude unrivaled, but licentious in its modes of operation, and more or less chaotic in its results; "wild above rule or art, enormous bliss." The new German criticism exhibited in the chaos the orderly outlines of a world; co-ordinated the confusion under rules till then unsuspected, and showed in what before had seemed irregular exercise of power admitted to be magnificent, obedience not less magnificent to a law of artistic evolution. It made calculable, in a word, the orbit of a luminary which had somewhat uncomfortably seemed to be sweeping at random through space. But the English people did not need it to reveal the luminary to them; throughout and from the first, they had seen and devoutly worshiped it. Also, to a great extent, it is due to the German enthusiasm of exposition, that over the whole continent, and wherever literature is intelligently studied—some little lingering, dying remnant of French prejudice except—the poet *par excellence* of England is now finally enthroned as the poet *par excellence* of our whole modern world and civilization. The bibliography of the subject is enormous. The best of the recent criticisms and editions are those of Dowden, Furnivall, Swinburne, Richard Grant White, and Furness.

SHALE, or **SLATE-CLAY**, an indurated clay, which often forms beds in the coal measures. It is chiefly composed of silica and alumina, in variable proportions, but also frequently contains a considerable amount of carbonate of lime and of oxide of iron. It is of a gray or grayish-black color, or brownish-red when containing much iron. Its structure is more or less slaty. It is soft, and easily reduced to powder. It is used for making slate-pencils. When free from lime and iron, it is reduced to powder, and used for making fire-bricks, for which it affords an excellent material. Shale very often contains a notable quantity of bitumen, and when this is so much the case that the mineral has a shining resinous streak, and crackles and blazes in the fire, emitting a black smoke and a bituminous odor, it is known as *bituminous shale*. This variety sometimes passes on the one hand into common shale, and on the other into coal. Impressions of ferns and other plants are very frequently found in shale.

Slate, Schist, and Shale are names employed to denote those kinds of rock which are laminated or fissile—that is, which possess a structure readily splitting into thin layers. Shale and schist are almost synonymous, although the latter should be restricted to rocks with their layers irregular or foliated. True slate differs from them in not having its lamination produced by bedding. See **SLATE**. Nevertheless, all three names are often applied to the same substance.

Shale varies much in its composition. Clay, sand, lime, bitumen, and other bodies, either singly or any mixture of them, are included under the name, if they form rocks which split into layers in the direction of their bedding; clay, however, being an ingredient in most shales. Strange as it may seem, the line between even coal and some kinds of shale is not well defined; and in the case of the Torbanehill mineral, found near Bathgate, the question by which of the two names it should be called led to a lengthened and costly litigation.

The importance of certain decomposing shales through which sulphuret of iron is disseminated, for the manufacture of alum, has been long known, and the quantity raised for that purpose from the carboniferous beds of Lancashire and Lanarkshire and the lias beds of Yorkshire is very considerable, yielding about 16,000 tons of manufactured alum annually. Shales of a similar kind are worked in France, Germany, and North America.

Bituminous shales—that is, shales more or less rich in carbon and hydrogen—form another class of these bodies which have, in recent years, attracted much notice as sources of oil for illuminating purposes. It is now more than thirty years since a Frenchman, named Du Buisson, introduced a method of distilling certain bituminous shales in France, at a comparatively low temperature, so as to obtain burning-oil and other products. The process was afterward tried in England, being used for a time in distilling a Dorsetshire bituminous shale, sometimes called "Kimmeridge coal." From this mineral a burning oil, a lubricating oil, and a naphtha for dissolving caoutchouc, were obtained. But neither in France nor in England did the attempt to make a profitable manufacture succeed: in the former country the poverty of the shales was the chief drawback; in the latter, the disagreeable smell of the oil, which could not be effectually removed, prevented it from obtaining favor in the market.

On account of these failures the process fell into abeyance, until it was revived again by the success of the well-known patent of Mr. James Young (see **NAPHTHA**), secured in 1850 for the production of paraffine and paraffine oil from coal. With the exception of the solid paraffine, which Mr. Young was the first to obtain on the large scale, and the employment of coal instead of shale, the processes of Du Buisson and Young are essentially the same. This process has created a new and rapidly-increasing branch of industry, paraffine oil and paraffine being economically obtained by it from either coal or shale.

of certain kinds. Those who have paid any attention to the various beds of minerals which go to form what is geologically called the coal measures are aware that it is only the seams of coal, ironstone, fire-clay, sandstone, and limestone which until very lately have been looked upon as of any industrial importance. Interstratified between these and the other minerals of the series are numerous beds of carbonaceous or bituminous shale, until recently considered useless. Many of these shales were found upon trial to yield from 30 to 50 gallons of crude oil per ton; and works—several of them of great size—have accordingly been started in many places over the entire area of the coal formation in Scotland, and also at various localities in England and Wales, for the manufacture of mineral oil, paraffine, etc., from this material.

Owing partly to the comparative cheapness of shale, and partly also to the fact that these products are obtained from it in a state more easily purified than when they are got from coal, the use of the latter as a source of them is now almost entirely given up. In Scotland, where the manufacture of paraffine oil is chiefly carried on, the shales used are called "oil shales," and it is estimated that there are now 800,000 tons of this material annually distilled. Such a quantity yields the following products:

Crude oil.....	25,000 gallons.
Paraffine.....	5,800 tons.
Lubricating oil.....	9,800 "
Sulphate of ammonia.....	2,350 "

In the refining process the crude oil is reduced to about one-half of its bulk before it is fit for burning. Besides the above, there is also a considerable quantity of "coal gas," unavoidably produced, and partly wasted. But for the distance of the oil works, this would be consumed in some of the larger Scottish towns. Shales found in the Lias and some other formations, likewise yield mineral oil.

SHALER, ALEXANDER, b. Conn., 1827; in 1845 entered the New York state militia and at the beginning of the civil war was maj. of the 7th regiment N. G. S. N. Y. In 1861 he became lieut.col of volunteers; he served in the Peninsular campaign, with Pope and McClellan, at Fredericksburg, Marye's heights, Gettysburg, and Rappahannock; was captured in the battle of the Wilderness, and exchanged, Aug. 1864. At the end of the war he received the brevet rank of maj.gen., and from 1867-86 was maj.gen. of the 1st division of the New York state national guard.

SHALER, NATHANIEL SOUTHGATE, b. Ky., 1841; graduate of Lawrence scientific school, Cambridge, 1862; director of the geological survey of the state of Kentucky. professor of paleontology at Harvard university, and assistant at the museum of comparative zoology. He published reports of the Kentucky survey, and has written *A First Book in Geology* (1884), and *The Interpretation of Nature* (1893).

SHALLOON', a light worsted cloth, said to have been first made at Chalons in France, and to have derived its now corrupted name from that place.

SHALLOP (Fr. *chaloupe*), a large, open, old-fashioned boat, carrying two masts, rigged as in a schooner. Its principal use was in the fisheries, but it has now nearly given place to luggers and yawls.

SHALLOT, *Allium Ascalonicum*, a species of *allium* (q.v.), a native of the east, introduced into Europe by the crusaders—from Ascalon, it is said—and much cultivated for its bulbs, which are used like those of the onion, and sometimes for its leaves, which are used like those of the chive. The leaves grow in tufts like those of the chive, but are larger. The shallot is generally propagated by the cloves, which are planted just beneath the surface of the ground, or only partially beneath it, in spring, and the crop is ready for gathering in July or August. The flavor resembles that of garlic, but is much milder. In the vineyards of Italy the shallot is naturalized.

SHAMA'KA, a t. in the government of Transcaucasia, Russia, containing two villages 15 m. apart. The old town was razed to the ground in 1737 by Nâdir Shah, but has been rebuilt, and in 1892 had 22,139 inhabitants. The place is noted for its extensive silk manufactures. Silk-worms are reared, and there are tanneries and dyeworks.

SHAMANISM is the ancient religion of the Tartar, and some of the other Asiatic tribes. It is a belief in sorcery, and a propitiation of evil demons by sacrifices and frantic gestures. The following account of it is extracted from the *Asiatic Journal*. The priests are men or women, married or single. The character is acquired by pretending that the soul of a deceased priest has appeared to the individual in a dream, appointing him or her his successor. If the priests are in function, they wear a long robe of elk-skin, hung with small and large brass and iron bells; moreover, they carry staves carved at the top into the shape of horses' heads, also hung with bells; and with the assistance of these staves they leap to an extraordinary height. The followers of the Shaman religion have neither altars nor idols, but perform their sacrifices in a hut raised on an open space in a forest or on a hill. Nor are there fixed periods for the performance of their ceremonies; births, marriages, and sickness, uncommon appearances in the atmosphere, or public calamities, are generally the occasions which call for them. The animal to be sacrificed

is generally fixed upon by the shaman or the donor; and after the persons uniting in the ceremony have assembled, the shaman enters the hut, chanting certain words, sprinkles on all the sides of the hut, and over the fire, spirits and milk, and then orders the animal to be killed, which is done by its heart being torn out. The skin of the victim is then stripped off, and its flesh, with the exception of a few pieces which are thrown into the fire, is consumed by the persons assembled. See also LAMAISM.

SHAMMAI (not, as has often been done, to be confounded with Sammeas), an eminent doctor of the Jewish law at the time of Herod, head of a most important school, and supreme judge of the sanhedrim (ab-beth-din) during the presidency of Hillel (q. v.), along with whom he is, indeed, generally mentioned, and of whom he was, as it were, the very counterpart. Very little is known of the history of his life. He most probably was born in Palestine, and most energetically participated in all the political and religious complications of the country. There was a harshness and rigidity in his character which contrasts most strikingly with Hillel's proverbial patience. His religious views were painfully strict, and he even tried to extend the rigor which he imposed upon himself, to the youngest children; but the zealotism with which later times have charged him is not his, but his school's, "the House of Shammai," as it was called. This seems, under the adverse circumstances of the commonwealth—sedition within, and the approaching enemy without—to have developed a fanatical zeal that at times surpassed all bounds, and chiefly tended to foster that exceptional exclusiveness which proved both the bane and the saving of Judaism. The discussions of the two rival schools, of which that of Shammai preponderated long after the master's death, turned exclusively upon points of positive law. There is only one curious metaphysical debate recorded, viz., whether, as one school held, "it was better for man to have been created or not;" or, as the other asserted, "it would have been better if he never had been created." Finally, they both agreed in the latter axiom, but with the addition—"but since he is now in this world, let him be careful in his actions. We need hardly point to the strange light which this discussion and final decision throw upon the times of unequaled national misery that begot them.

SHAMMY. See LEATHER.

SHAMO, or **Gobi**, the Chinese and Mongol names respectively for a wide region of steppe and desert in the eastern part of central Asia. It extends from the Thian-Shan mountains to the Kuen-Lun and Nan-Shan mountains, bordering on eastern Turkestan to the w., and occupying great part of the area between 40° and 50° n. lat., and 90° to 120° e. long. The "desert" is by no means sterile throughout. On the n. and on the s. is a wide belt of firm steppe, consisting for the most part of vast green levels covered with abundance of pasture, but broken by numerous ridges of hills. Between these two belts, each at a height of from 4,500 to 5,500 ft. above the sea, lies a depressed tract, not more than 2,500 to 3,000 ft. above sea level, and varying in breadth from 230 to 460 miles. This alone is properly called Shamo, or "sea of sand;" it is a perfect wilderness of sand and stones, and is probably the bed of an ancient sea. The salt sand of which its soil is mainly composed produces nothing but a few scrubby plants. The fauna of the Shamo, even in the wider sense, is limited, including little save hamsters, dziggetais, a few wild sheep, and antelopes. There are no fixed habitations even in the steppe country; the inhabitants, chiefly Mongols, are all nomads. Yet in various places there are traces of ancient cities buried in the shifting sand (see *Ocean Highways* for 1873). The winter here is intensely cold and stormy, and the summer excessively hot. Yet the wandering hordes of Mongols have no difficulty in keeping large herds, which find plenty of rich pasture on the steppes, and even in winter contrive to pick sufficient food from beneath the snow. From want of wood the nomadic tribes have to use dried dung as fuel. Little is known of the Shamo save in the neighborhood of the main tracks across it, of which the chief is from Maimatchin to Peking.

SHAMOKIN, a borough in Northumberland co., Pa.; on the Lehigh Valley, the Northern Central, and the Philadelphia and Reading railroads; 18 m. s.e. of Sunbury, the co. seat. It contains high and graded schools, public school property valued at over \$250,000, national and state banks, electric railroads, electric light plant, waterworks supplied from Shamokin creek, about 20 churches, and a Y. M. C. A. It is in the anthracite coal region, and has several mines, foundries, machine shops, hotels, and daily and weekly newspapers. The borough is situated near the Broad range of mountains, and mines and ships a large quantity of coal annually. Pop. '90, 14,403.

SHAMROCK, a national emblem of Ireland, a leaf with three leaflets, or plant having such leaves, sometimes supposed to be the wood sorrel, but more generally believed to be some species of clover, or perhaps some common plant of some of the nearly allied genera, as the bird's-foot trefoil, or the black medick. It is not improbable that the name has a sort of general reference to plants with trifoliate leaves, and that a more exact determination of the species may be as difficult as the attainment of botanical accuracy in regard to the emblematic thistle of Scotland.

The small-leaved clover (*trifolium repens*) has had a superstitious respect attached to it from early times. According to the elder Pliny no serpent will touch it. It is said

to have been first assumed as the badge of Ireland from the circumstance that St. Patrick made use of it to illustrate the doctrine of the Trinity. See BIRD'S FOOT TREFOIL.

SHAMYL, or **SCHAMYL** (Eng. "Samuel"), the celebrated leader of the independent tribes in the Caucasus, was born 1797, at Aul-Himry, in Daghestan, and belonged to a wealthy Lesghian family of rank. He was one of the zealous disciples of Kasi-Mollah, the great apostle of Muridism, and ably seconded his endeavors to compose the numerous feuds of the various Caucasian tribes and unite them in a bond of antagonism to their common enemy, the heretical Russians. He was one of the foremost in the defense of Himry against the Russians, Oct. 30, 1832, and, after the fall of his chief Kasi-Mollah and most of his adherents, fought his way alone and severely wounded through the besiegers' ranks. After the assassination of Hamzad-Bey, the successor of Kasi-Mollah, in the end of 1834, Shamyl was unanimously elected "inaum," and being absolute temporal and spiritual chief of the tribes who acknowledged his authority, he made numerous changes in the religious creed and political administration for the purpose of more fully concentrating in himself the whole power. These changes were certainly the chief cause of the great successes which subsequently attended the mountaineers, but it is none the less certain that they produced that sudden collapse of the spirit of independence which took place when the great leader was removed. Shamyl's change of military tactics from open warfare to surprises, ambuscades, etc., brought numerous and sometimes great successes to the arms of the mountaineers. Gen. Ivelitch was severely defeated in 1837, the worst reverse the Russians had yet sustained, and his coadjutor Hafi was forced to make a disastrous retreat. They succeeded, however (1839), in hemming Shamyl into Akulgo, in Daghestan, took the fortress by storm, and put every one of the defenders to the sword, in order to be quite certain that Shamyl should not escape. How he did so is not known, his own followers and the Russians believed him to be dead, when, to the joy of the one and the bitter confusion of the other, he suddenly appeared, preaching with more vigor than ever the "holy war against the heretics." In 1843 he conquered all Avares, besieged Mozdok, foiled the Russians in their subsequent campaign, and gained over to his side the Caucasian tribes which had hitherto favored Russia. This accession of power rendered necessary some change in the government; a civil and a criminal code were promulgated, a regular system of taxation established, and Dargo was made the capital of this Caucasian monarchy, the population of which now (1844) exceeded 1,000,000. But the Russians, under prince Woronzoff, having changed their tactics, assailed the country on various points at the same time, and the advance gained was secured by chains of forts. The fortune of war, however, steadily alternated till 1852, when Bariatinsky compelled Shamyl to confine himself to the defensive, and deprived him of his victorious prestige. Some of the tribes now returned under Russian authority, and Shamyl (probably owing to his diminished power and resources) was unable to take advantage of the diversion in his favor afforded by the Crimean war, after the conclusion of which the Russians resumed their attacks with more energy, opened a road over the mountains, thus cutting off one portion of the patriots and compelling their submission. The following year was still more disastrous; 100 villages were destroyed, the inhabitants transplanted to Russian districts, and Shamyl himself defeated, Aug. 11. On April 12, 1859, his chief stronghold, Weden, was taken after a seven weeks' siege, and his authority, except over the small band of followers who still devotedly adhered to him, was wholly destroyed. For several months he was a mere guerrilla chief, hunted from fastness to fastness, till at last (Sept. 6, 1859) he was surprised on the plateau of Gounib, and after a desperate resistance, in which his 400 followers were reduced to 47, he was captured. His wives and treasure were spared to him, and he was sent to St. Petersburg, where he experienced a generous reception from the czar. A few days afterward he was assigned a residence at Kaluga, with a pension of 10,000 rubles. Thence he went in 1870 to Mecca, remaining a parole prisoner of the Russian government; and died at Medina in Mar., 1871, in the 74th year of his age.

SHANGHAI, the most important maritime city of China, situated on the left bank of the Hwangpoo or Woosung river, 12 m. from where it debouches into the southern portion of the mouth of the Yang-tse-Kiang, in lat. 31° 15' n., and long. 121° 29' e. Though it is now one of the first emporiums of commerce in the east, only a quarter of a century ago it was but a third-rate Chinese town. It is a *hien* or *district* city, having a wall 3½ m. in circuit, through which 7 gates open into extensive suburbs. The low alluvial plain on which it is situated is of great extent, and intersected by innumerable creeks, which environ the walls, and permeate the city in various directions. The city consists of two distinct parts. The first is the native Chinese town, with narrow, dirty streets; the second the European and American settlement with wide streets and fine buildings. Conspicuous buildings are the Protestant cathedral, the Roman Catholic cathedral, a massive edifice, and the Baptist chapel. The temples present the same general appearance met within all Chinese cities. Every city has its ching-hwang, or temple of the tutelary gods: that of Shanghai is in a picturesque position on a rocky islet, surrounded by a serpentine sheet of water, which is crossed by zigzag bridges. A little further down the river stand the foreign settlements, English, French, and American. The whole of the mercantile *hongs* are built upon the English concession; while the French concession is

mainly occupied by *go-downs*, wharves, and Chinese houses. The river in front of the Chinese town is thronged with junks, lashed side by side. The reach in front of the foreign settlement was formerly crowded with sailing-vessels; but since the opening of the Suez canal, the steamers of the P. and O. steam navigation company and of private companies have largely taken their place. Lower down are the ship-yards, machine-shops, and dry-docks, which foreign commerce has called into existence; and here the Chinese government has at work an arsenal where war-vessels of the largest tonnage are built and equipped. Under the arrangement by which the foreign custom-house dues are collected by foreigners, facilities have been created for the navigation of the Yang-tse by stationing a light-ship, buoys, and signals, rendering safer the approach to this important mart. One or two light-houses have also been recently erected, giving additional security to vessels entering and leaving the port. There are a chamber of commerce, reading-room, library, and literary institution—nothing being wanting to render the port of Shanghai the metropolis of eastern commerce. The municipal government of the foreign settlement is highly creditable to the mercantile traders. Several gentlemen are elected annually by the land-holders, for the purposes of local government—police, public improvements, and repairs requiring much management, and entailing much expense, the funds for which are obtained by taxation. Shanghai is also the seat of various missions for converting the natives—the schools, dispensaries, and other benevolent objects meeting with generous support from foreign merchants. The products of Shanghai itself are not of much value, but the city is a most important entrepot for goods passing between the n. and s. provinces of China, as well as for the imports and exports from and to foreign countries. It was in the possession of the Tae-ping rebels from 1853 to 1855, and the prosperity both of the native town and the foreign settlements was in peril for a time; but it enormously advanced after their expulsion—the English quarter in particular becoming a refuge for the Chinese from all parts of the province of Kiang-su, which the Tae-pings continued to desolate up to 1862. The trade of the port increased threefold between the years 1860 and 1863; and this increase was due in a great measure to the large and increasing trade from the ports opened on the Yang-tse. Shanghai was connected with Tien-tsin by telegraph in 1881. In 1895 the imports of foreign produce had a value of \$98,639,609 and the exports were valued at \$70,200,338. The articles of import and export are of a most miscellaneous description; the chief articles of import being opium, English cotton and woollen goods, oil, coal, and metals; and of export, tea, cotton, paper, rice, cloth, medicine, sugar, tobacco, wax, wool, silk, etc. Great quantities of the opium imported into Shanghai are re-exported to the other parts of China. The mercantile importance of Shanghai has increased greatly through the opening of the Yang-tse river to commerce. In 1876 the first railway in China was opened from Shanghai to Kangwang, but it has since been bought up by the government and closed. The population is estimated to be 400,000, of whom 2000 are strangers.

SHANNON, the longest of the rivers of Ireland, rises in the Cuilcagh mountains, county of Cavan, and after a course of 254 m. falls into the Atlantic ocean between the headlands of Loop and Kerry Head. It is commonly divided into two portions, the upper Shannon from its source to Limerick, and the lower Shannon from Limerick to the sea, a distance of 56 miles. In its upper course it passes from its source in Cavan to lough Allen in the county of Leitrim; thence through a difficult channel, where the navigation is in part transferred to a canal, to a small extension called Corry lough, and with alternations of river and lake, to lough Forbes, in the county of Longford, on leaving which the river for a time attains an average width of 250 yards as far as Lanesborough. Here it is again merged in a lake called lough Ree, which stretches 10 m. southward to within 2 m. of Athlone. At this point great natural difficulties have been overcome, and the course of the river, by Shannon harbor and Portumna, and through the picturesque lough Derg to Killaloe, has been so deepened and improved that a regular passenger and goods traffic is maintained. From Killaloe to Limerick the navigation, owing to the rapid fall, is again in part transferred to a canal. On approaching Limerick the river divides into two branches, and on the island thus formed stands what is known as the Irish town, in contradistinction to the English town, of Limerick. From the city, where an extensive and commodious range of quays has been built to the sea, the Shannon is navigable to sea-going vessels; and though near the city very shallow at low water, the navigation for the last 40 m. is free at all times of the tide. The entrance between Kerry Head and Loop is 7 m. across. About 10 m. from the entrance the river narrows to about a mile and a half in width. At present, however, the outward navigation commences at Foynes, which is connected by railway with Limerick, and from which steamboats daily ply to Kilrush, Tarbert, and the intermediate stations. Several rivers of considerable size fall into the Shannon during its course, as the Suck, the Brosna, the Fergus, the Maigue, and the Feale. The improvement of the Shannon was commenced under the Irish parliament. In 1837 the work was placed under a board of commissioners, by whom a sum of more than half a million was expended. It has since been transferred to the board of works or local government board. The navigation is open from the head of lough Allen to Limerick, a distance of 143 m. in a direct course, but by the addition of the Boyle branch of 9 m., and the Strokestown branch of 6 m., a total length of river and canal navigation of 158 m. is now open, over 129 m. of which

large river steamers freely ply. This important system of navigation, which occupies a position almost midway between the e. and w. coasts of Ireland, is connected with Dublin by means of the Grand and Royal canals.

SHANNON, a co. in s. western S. Dakota; formed 1875. Area, 1080 sq. m.

SHANNON, a co. in s. Missouri, drained by the Current river and Jack's fork; about 960 sq. m.; pop. '90, 8788, chiefly of American birth. The surface is hilly and heavily wooded. The soil is fertile. The principal productions are hay and corn. Co. seat, Eminence.

SHANNY, a species of acanthopterous fish belonging to the family *blenniidae* or blennies. See **BLENNY**. The shanny is *blennius pholis*. In this species all the rays of the dorsal fin are of nearly equal length except the eleventh and twelfth, which are short. There are 31 dorsal rays, 13 pectoral, 2 ventral, 19 anal, and 11 caudal. The color is very variable, of shades of brown. They are distinguished from other species by the absence of appendages of the head.

SHAN-SI' (West of the Hills), a province of n.w. China, is of rugged surface, and lies on the western limits of the plain. The surface is generally mountainous. It supplies the purest iron ore and the best coal in China, besides cinnabar, copper, marble, and other minerals. Area, 56,268 sq. m. Pop. '82, 12,211,453.

SHAN STATES, a number of tributary states in Indo-China, lying between Munnipur on the w. and Yun-nan on the e., and from the parallel of 24° n. lat. s. to Bangkok and Cambodia. Of these the northern states are tributary to Burmah (q. v.), and the southern to Siam (q. v.). A great portion of the mountainous region of these states is called the Laos country. The Laos races are divided into two curiously distinct subdivisions. The northern race, beyond the northern frontier of Siam, are called *black-bellies*, from the circumstance that they tattoo themselves with figures in ink, printed on their bodies with sharp needle-like points; the southern race, mostly on and within the eastern frontier of Siam and tributary to that kingdom, are called *white-bellies*, and do not tattoo. They are meek, gentle, unwarlike, and superstitious. Their chief employment is agriculture; and the principal crops raised by them are rice, maize, the sweet potato, calabashes, red pepper, melons, and other fruits. They also have a considerable trade in silver, gold-dust, copper, gum, lac, wax, and dye-wood. In religion they are Buddhists.

SHAN-TOONG, a province in n.e. China, on the Yellow sea; 53,762 sq. m.; pop. '82, 36,247,835. The surface is very mountainous and not very fertile. The principal river is the Hoang-Ho, emptying into the gulf of Pe-chi-li; the province is traversed also from s. to n. by the great canal. Many minerals are found, among them coal and gold, but work on them is hindered on account of lack of facilities of transportation. The products are millet, wheat, indigo, silk, and hemp. The chief towns are Tsi-nan, the capital, Yen-chow, Tsing-chow, Sai-chow, and Woo-ting.

SHA PINSHAY, one of the Orkney islands, about 4 m. n.e. of Kirkwall. It is 5 m. long and $4\frac{1}{2}$ m. in extreme breadth. The fine natural harbor of Elwick bay on the s. side is overlooked by a pleasant modern village.

SHARI, (i. e., *river*), the principal feeder of lake Tsad or Tchad (q. v.).

SHARJA, a t., capital of the province of Sharja, Arabia; on the Persian gulf, about 215 m. n.w. of Muscat; pop. estimated at 25,000. The harbor is poor, but the port is the chief import city for Persia. Weaving is the main occupation of the inhabitants, and quantities of the oriental tapestries, cloaks, curtains, carpets, etc., are made. The principal building is the government treasury.

SHARK, *Squalus*, a Linnæan genus of cartilaginous fishes, now forming in Müller's system a suborder of *plagiostomi* (q. v.), and divided into a number of families and many genera. The sharks have generally an elongated form, tapering gradually to the tail, and not much thickened in the middle. The muzzle projects over the mouth; the nostrils are situated on the under-side of the muzzle. The males have claspers. The gill-openings are lateral. There is no cartilage between the snout and the pectoral fin, as in the rays. Some of the sharks are ovoviviparous; others lay eggs, generally a pair at a time, more being produced in succession. The eggs are large in comparison with those of osseous fishes, and are of a square or oblong form, with a tough horny coat, each corner prolonged into a tendril, the tendrils being apparently of use for their entanglement among sea-weeds. These eggs, or at least their empty cases, are very frequently cast up by the waves on the sea-beach, and are popularly known as *sea purses* or *mermaids' purses*. Near the head of the inclosed embryo there is a slit in the case through which water enters for respiration, and there is another at the opposite end, by which it is discharged. The young fish ruptures the case at the head, where it is weaker than at any other part, and on issuing from it, carries a yolk-bag attached to its belly for its nourishment until it is able to seek food. At this stage of its existence, its respiration is also aided by filaments projecting from the gills through the gill-openings, which are absorbed as it grows older. The teeth are generally large, sharp, and formed for cutting, with the edge often serrated; but in the genus *cestracion* (q. v.) the teeth are

pavement-like; and in some genera they are small and numerous. The angel-fish (q. v.) is ranked among the sharks, but differs from the rest in its flattened form. Some of the smaller sharks are popularly known by the names dogfish, hound, tope, etc. In the articles Cestracion, Dogfish, Fox Shark, Hammer-head, Porbeagle, and Tope, some of the shark tribe are noticed. It only remains here to notice a few of the more interesting of those which do not come under any of these heads.

The WHITE SHARK, *Carcharias vulgaris*, is the most dreaded of all the monsters of the deep. The family *carchariidae*, to which it belongs, have two dorsal fins, the first dorsal placed over the space between the pectoral and ventral fins; they have a nictitating membrane; and have no spout-holes. In the genus *carcharias* the snout is flattened. The white shark attains a great size; one has been caught of 37 ft. in length. The body is covered with a hard skin, and is grayish-brown above and whitish below. It is a very rare visitant of the British coasts, if indeed another species has not been mistaken for it; but is found in the Mediterranean, and is plentiful in the seas of many of the warmer parts of the world, often following ships to feed on any animal substance that may be thrown or may fall overboard, and often in its indiscriminate voracity swallowing things which are indigestible. A lady's work-box has been found in a shark's stomach; and the papers of a slave-ship, which had been thrown overboard, in that of another. Human beings are not unfrequently its prey, and a large shark is not only capable of biting off the limb of a man, but of snapping the body in two, and has even been known to swallow a man entire. Its head is large, the mouth large and wide; furnished with a terrible apparatus of teeth, of which there are six rows in the upper jaw and four in the lower; the teeth are triangular, sometimes 2 in. in breadth, sharp-edged, and serrated; when not in use they are laid back in the mouth, nearly flat, but when the shark bites they are brought up—or at least those of the outer rows—by means of muscles with which each tooth is independently provided. The tail, as in all the sharks, is heterocercal, but its lobes are more nearly equal than in most of them. The shark is often captured by sailors, by means of a great hook baited with a piece of meat, and attached to a chain, as the shark's teeth readily bite through any rope. When the shark is hooked and hauled on board, great care is requisite to avoid danger both from the mouth and from the tail, the powerful action of the latter being generally interrupted by a sailor springing forward and cutting it above the fin with a hatchet. A curious method of catching the shark is practiced in the South Sea Islands; a log of wood is set afloat with a strong rope attached to it, at the end of which is a noose, and the sharks gathering about it as if from curiosity, one of them may be expected soon to get its head into the noose, and is at last wearied out by the log. Formidable as the shark is, men have sometimes successfully braved it in its own element, watching its turning—as from the position of its mouth it must do—to seize its prey, and stabbing it in the belly.

The BLUE SHARK, *Carcharias glaucus*, is much smaller than the white shark, seldom exceeding 8 ft. in length. It is also of a more slender form. The upper parts are of a blue color, the belly white. This species is common in the Mediterranean and in the warmer parts of the Atlantic. It is not unfrequent on the south-western coasts of England in summer, apparently coming in pursuit of pichards, and often doing great mischief to the nets and lines of fishermen, its sharp teeth biting through a net or line with the utmost ease.

The BASKING SHARK, *Selache maxima*, belongs to the family *lamnidae*, having two dorsal fins, spout-holes, and no nictitating membrane. The snout of the basking shark is short and blunt; the teeth are small, numerous, conical, and curved backward. The skin is much rougher than in the white shark and blue shark. This species attains a great size, being sometimes 36 ft. long, but it is not so thick in proportion as the white shark. It is of a blackish-brown color, glossed with blue. It does not exhibit a ferocious character, and is supposed to feed on medusae, crustaceans, and the like. It is often seen swimming slowly with its dorsal fin above the surface of the water, whence it has obtained the name of *sail-fish*. It permits itself to be quite closely approached by a boat, but on being struck with a harpoon it plunges suddenly down, and swims off with great rapidity, so that its capture is attended with danger. It is not uncommon on the northern and western coasts of Britain.

The GREENLAND SHARK, *Scyrnus borealis*, is of the family *scymnidae*. It has large spout-holes, two dorsal fins, no anal fin, and no nictitating membrane. It inhabits the northern seas, and is rarely seen so far south as even the northern Scottish islands. It attains a length of 14 feet or more, is thick, and tapers suddenly at the tail; the fins very small; the teeth in both jaws so arranged as to diverge from a center. It bites and annoys whales, but feeds also on small fishes and crustaceans. When a whale has been killed, a shark will often come even whilst men are occupied in cutting off the blubber, and scoop out one great lump after another, and will return to its repast after having been severely wounded.

The rough skin of sharks is employed by joiners for polishing fine-grained wood, and for covering the hilts of swords to make them firmer in the grasp. The flesh is coarse, but is sometimes eaten. The fins abound in gelatine, and are much used by the Chinese for making a rich gelatinous soup. Dried sharks' fins are a considerable article of import into China. The liver yields a large quantity of oil, which is now also, in some

parts of the world, an article of commerce. For the sake of this oil a shark fishery is prosecuted on the coast of Ceylon.

Fossil sharks make their first appearance in the oolitic rocks, from which eight species have been described. They become more numerous in the cretaceous deposits, in which no less than 60 species have been found. In the tertiary strata, their remains are still more abundant. But as the determination of fossil species depends entirely on the teeth, which, with the exception of the spines and vertebrae, are the only portions preserved, it is probable that the species and genera are too greatly multiplied.

SHARKEY, a co. in w. Mississippi; formed 1876; crossed by Deer Creek; having Mississippi river for its w. boundary. Pop. '90, 8882. Area, 425 sq. m. Co. seat, Rolling Fork.

SHARON, a borough in Mercer co., Pa.; on the Shenango river and the Erie, the Lake Shore and Michigan Southern, and the Pennsylvania co.'s railroads; 80 miles n.w. of Pittsburgh. It contains a public high school, Hall institute (Bapt.), public school and institute libraries, Buhl hospital, electric street railroads, electric-light plant, water-works, about 12 churches, national and private banks, several large iron and steel works, steel casting plant, rolling mill, boiler works, tile works, machine shops, and stove works. Pop. '90, 7459.

SHARON WILLIAM, b. (1821) at Smithfield, Ohio; studied law, went into the banking business in Nevada, was trustee of the bank of California in San Francisco, amassed a large fortune in Nevada silver mining; U. S. senator from Nevada, 1875-81. He d. 1885.

SHARON SPRINGS, a village in Schoharie co., N. Y.; on the Delaware and Hudson railroad; 59 miles w. by n. of Albany. It is a noted summer and health resort, with several sulphur, magnesia, and chalybeate springs, and a picturesque waterfall. Pop. '90, 622.

SHARP, a sign # in music, which, when prefixed to a note, elevates it by a semitone. When placed at the beginning of a piece of music, it denotes that all the notes on the line or space on which it is placed, and their octaves above and below, are to be played sharp. A double sharp \times raises a note two semitones.

SHARP, GRANVILLE, 1734-1813; b. England; abandoned the study of law for a place in the ordnance office. He soon became interested in behalf of the slave. West India planters being accustomed, after bringing slaves to England, to carry them back or sell them to others for that destination, great hardship resulted. Sharp rescued several individuals, and in 1772 he obtained the decision of the English judges in the famous case of the negro Somerset, that as soon as a slave sets his foot on English ground he becomes free. From that time he devoted himself to the destruction of slavery and the slave trade, writing and publishing many pamphlets and books. He was chairman of the meeting in 1787 which formed the "association for the abolition of negro slavery;" was one of the founders of the colony of Sierra Leone; opposed imprisonment of seamen, and advocated parliamentary reform.

SHARP, JAMES, Archbishop of St. Andrews, was the son of William Sharp, sheriff-clerk of Banffshire, and was born in the castle of Banff, May, 1618. Educated for the church at the university of Aberdeen, where he attained distinction as a student, and where he is said (on the authority of a tract, entitled *A True and Impartial Account of the Life of the Most Reverend Father in God, Dr. James Sharp, Archbishop of St. Andrews*, published in 1719) to have protested against the "Solemn League and Covenant;" he afterward visited England, and became acquainted with several eminent English divines, such as Hammond, Sanderson, and Taylor. Returning to Scotland, he was appointed a professor of philosophy at St. Andrews, through the influence of the earl of Rothes, and soon after minister of the parish of Crail, an office which he held during the ascendancy of Cromwell. In Aug., 1651, when Monk was reducing Scotland to obedience, he was carried off, along with several other ministers, to England. Sharp quickly regained his liberty, and he possessed, for some years, the confidence of the more moderate party in the church. In 1656 he was chosen by them to plead their cause in London before the protector against the rev. James Guthrie, a leader of the extreme section (the protestors or remonstrators), which he did with so much dexterity that Cromwell is reported to have said: "That gentleman, after the Scotch way, ought to be termed Sharp of that ilk." When the restoration was on the eve of happening, Sharp was appointed by the moderate party to act as its representative in the negotiations opened up with Monk and the king. This is the crucial period of his career, and on the view we take of his motives depends our whole estimate of his character. Was he sincere, or did he mean to betray the church to which he owed allegiance? Presbyterian writers are nearly unanimous in affirming his perfidy, although the evidence is doubtful. Among the first things the Scottish parliament that met Jan. 1, 1661, did, was to repeal or rescind every act passed since 1638, in consequence of which Episcopacy remained the church of Scotland, as "settled by law"—a dishonorable evasion of a promise made by Charles in a letter written to the presbytery of Edinburgh in Aug., 1660. Soon after, at a council held in Whitehall, Sharp was nominated archbishop of St. Andrews, and having gone up to London, he was there formally con-

separated by the bishop of London and three other prelates. His government of the Scottish church was tyrannical and oppressive; and in consequence he became an object of hatred to most of his countrymen. When one Mitchell, a conventicle preacher, fired a pistol at him in the streets of Edinburgh, the populace allowed the intending assassin to walk quietly off, without making a single effort to arrest him. Finally Sharp was assassinated on Magus Moor, near St. Andrews, May 3, 1679, by a band of fanatical covenanters. In defense of Sharp, the utmost that can be said is that he was simply an ambitious ecclesiastic (of plausible and courtly manners), who had no belief in the "divine right" of presbytery, and who thought that if England were resolved to remain Episcopalian, it would be very much better if Scotland were to adopt the same form of church government, and that if there must be an archbishop of St. Andrews, there was no reason why he should not be the person.

SHARP, JOHN, D.D., 1644-1714; b. England; graduated at Cambridge in 1660; ordained in 1667; became domestic-chaplain to sir Heneage Finch, attorney-general; archdeacon of Berkshire, 1672; prebendary in the cathedral church of Norwich, 1675; rector of St. Bartholomew, London, 1676; dean of Norwich, 1681; chaplain to Charles II., and court-chaplain at the coronation of James II. in 1688; was suspended by the king for preaching in 1686 against the claim of the Roman Catholic church to be called "the only visible Catholic church;" dean of Canterbury, 1689, and bishop of York, 1691. In 1702 he preached at the coronation of queen Anne, and was made lord-almoner to her majesty. His sermons were published in 7 volumes after his death.

SHARPE, a co. in n.e. Arkansas, having the state line of Missouri for its extreme n. boundary; 570 sq.m.; pop. '90, 10,418, chiefly of American birth, with colored. It is drained by Spring river, and Strawberry creek, tributaries of the Black river. Its surface is hilly, and the soil produces cotton, corn, and oats. Iron, lead, and zinc are found in the high ridges of hills which cross it. Co. seat, Evening Shade.

SHARPE, SAMUEL, an Egyptologist, b. in London in 1799; became a banker, but is known chiefly for his contributions to the study of Hebrew, Egyptian, and Coptic hieroglyphics. He published many books on these subjects, among which are: *Vocabulary of Egyptian Hieroglyphics* (1837); *Egyptian Antiquities in the British Museum Described* (1862); *Inquiry into the Age of the Moabite Stone* (1879); *The Epistle of Barnabas* (1880). He d. 1881.

SHARPS, CHRISTIAN, 1811-74, b. N. J.; became a scientific machinist, and was the inventor of the Sharps rifle for military and sporting uses, and of other improvements in fire-arms. The manufacture of the rifle was begun at Hartford in 1854.

SHARPSBURG, a borough in Allegheny co., Pa.; on the Allegheny river, and the Pittsburg and Western, and the Pennsylvania railroads; 5 miles n.e. of Pittsburg. It has a state bank, several building and loan associations, public and private schools, and weekly newspapers, and contains coal mines, rolling mills, iron furnaces, and foundries. Pop. '90, 4898.

SHASTA, a co. in n. California, having the Shasta mountains of the Coast range for its w. boundary; drained by the headwaters of the Sacramento and Pitt rivers; 3960 sq. m.; pop. '90, 12,133, chiefly of American birth, includ. colored. It is intersected by a division of the Southern Pacific railroad. In the s.e. are Lassen peak, altitude 10,437 ft. above the level of the sea; Magee's peak; and Crater mountain, belonging to the Sierra Nevada range. The climate in the valleys is pleasant. The hills are covered with fir, pine, and redwood, and cottonwood trees grow by the rivers. The soil of the bottom lands is fertile, yielding large crops of barley, wheat, fruit, and dairy products. The vine is largely cultivated, and much wine made. Gold, silver, and copper are mined, and there are underlying strata of granite and limestone. It contains hot springs, and has flour, saw, and quartz mills. Co. seat, Redding.

SHASTRA, or SHÂSTER. See SANSKRIT LITERATURE.

SHAT-EL-ARAB. See EUPHRATES.

SHATTUCK, GEORGE CHEYNE, LL.D., 1783-1854; b. Mass., graduated at Dartmouth college, 1803; became an eminent physician of Boston, president of the Massachusetts medical society, and author of several professional works; built an observatory for Dartmouth college, and contributed liberally to its library; aided largely in the establishment of the Shattuck collegiate boarding-school at Faribault, Minn., under the direction of the Protestant Episcopal church; and at his death left \$60,000 to charitable objects.

SHAVE-GRASS. See EQUSETUM.

SHAW, HENRY W., b. Mass., 1818. When fifteen years old he went to the west and there engaged in farming and as an auctioneer. In 1858 he settled at Poughkeepsie, N. Y., where he died in Dec., 1885. Under the *nom de plume* of "Josh Billings" Shaw printed many popular comic sketches, and collections of proverbs embodying much practical wisdom in quaint speech. He also had some success as a comic lecturer.

SHAW, LEMUEL, LL.D., 1781-1861; b. Mass.; educated at Harvard, and admitted to the bar. He was a member of the state legislature, 1811-16, and again in 1819; of the state constitutional convention in 1820, and of the state senate, 1821-22, 1828, and 1829. He was chief-justice of Massachusetts, 1830-60. He is usually considered the ablest judge that ever sat in a New England court; and his decisions (particularly in the

department of real property) have had much effect on the growth of the law, and are still quoted as authority.

SHAW, ROBERT GOULD, 1776-1853; b. Maine; engaged in business in Boston, and acquired a large fortune. He bequeathed \$10,000 to be accumulated as the "Shaw fund" till it amounts to \$400,000, when, it is to be applied to the endowment of an institution for mariners' children.

SHAW, ROBERT GOULD, 1837-63; b. Boston; grandson of Robert Gould, the philanthropist; graduate of Harvard university, 1860. In the war of the secession he enlisted as a private in the New York 7th regiment April, 1861; transferred in May to the Massachusetts 2d., with the rank of 2d lieutenant; capt. Aug. 10; col. 54th Mass., 1863; commander of the first colored regiment from the north; killed at fort Wagner while gallantly leading his colored troops in the assault.

SHAW, SAMUEL, 1754-94; b. Boston; in early life a clerk, but at the beginning of the revolution became a lieutenant of artillery and served with great credit at Yorktown and elsewhere. After the peace he made a voyage to China, returned and was made first-secretary of the war department. In 1786 he was made consul at Canton. His journal with a memoir by Josiah Quincy was printed, 1847.

SHAW, THOMAS, D.D., 1692-1751; b. England; educated at Queen's college, Oxford. After acting for several years as chaplain to the English factory at Algiers he traveled in northern Africa, Palestine, and Asia Minor, returning to England in 1734. In 1740 he became principal of St. Edmund's hall, Oxford, regius professor of Greek, and vicar of Bramley, Hampshire.

SHAW LEFEVRE, Rt. Hon. GEORGE JOHN, a distinguished English statesman, b. June 12, 1832; graduated from Trinity college, Cambridge, was called to the bar in 1855, contested Winchester in 1859, and was returned M.P. for Reading in 1863, holding his seat until 1885, when defeated by Charles T. Murdock. In 1868 he carried the vote in the House of Commons for arbitration of the Alabama claims. He was secretary of the board of trade under Mr. Bright (1869-71); under-secretary, Home Office (1871); postmaster-general (1883-4); M.P. for Central Bradford (1885-95); and chairman of many important committees in the House of Commons. His publications include: *English and Irish Land Questions*; *Incidents of Coercion*; *Peel and O'Connell*; *Agrarian Tenures*; *English Commons and Forests*.

SHAWANO, a co. in n.e. Wisconsin; drained by Wolf, Oconto, Red, and Embarras rivers; about 1152 sq.m.; pop. '90, 19,236, chiefly of American birth. The surface is mostly woodland. Co. seat, Shawano.

SHAWL-MANUFACTURE. Perhaps no garment is of higher antiquity than the shawl; indeed, its simplicity of form would lead us to infer that it was the earliest in use. But of its manufacture we have no distinct account until the reign of the emperor Jelal-ed-din-Mohammed Akbar, in 1556, when the celebrated Cashmere shawls were among the most important manufactures of the world, and were thought worthy to be minutely described in the *Ayin-i-Akbari*, or the "institutes of the emperor." In that work four distinct classes of shawls, all of goat's wool, are described. The first were of remarkable lightness and softness, and were usually self-colored, and made of the wool undyed; the second were woven of wool in the natural colors—viz., white, black, and gray—these were probably arranged so as to form a plaid pattern similar to the shepherd's plaid of Scotland, which is of oriental origin; the third were called *gold-leaved*, probably from being embroidered with that material; and the fourth were long shawl-pieces large enough to inwrap the whole body. So carefully was this manufacture fostered that it received the chief attention of the emperor, and every shawl manufactured was carefully described and registered, and the number of manufacturers was so great that in Lahore alone it is stated there were upward of 1000. The manufacture, in later times, passed through many vicissitudes, and during last century it declined greatly; but in 1809 it had again risen, and there were then about 16,000 looms at work. The true Cashmere shawls are woven in many pieces, and joined together with great artistic skill; those of Britain and France are, however, woven in one piece, the loom being worked by hand, and of course furnished with a Jacquard machine for the production of the pattern. Besides the Cashmere shawls and their European imitations there is an infinite variety of shawls made of various materials—as silk plain, embroidered, and in the form of crape; thread, cotton, and silk lace, and wool.

SHAWNEE, a co. in n.e. Kansas, traversed by the Kansas river; 558 sq.m.; pop. '90, 49,172, chiefly of American birth, inclu. colored. It is drained by the Wakarusa river, and Soldier and Cross creeks. It is intersected by the Union Pacific, the Atchison, Topeka, and Santa Fé, and several other railroads. Co. seat, Topeka.

SHAWNEES. The name of a tribe belonging to the Algonquin family, which extended about the middle of the 17th c. from lake Erie s. as far as Florida, and a portion of which was in Pennsylvania at the time of the Penn settlement. In Carolina they were known as the Savannahs, or Semassees. Early in the 18th c. they allied themselves with the French, though formerly friendly with the English, and assisted them in the war with the latter. In 1758, however, they renewed their friendship with the English, and were engaged in opposition to the Virginians in 1774, who, however, defeated them. After the peace of 1786, being still influenced by the English, they took

part in the Miami war, fought Harmar and St. Clair, and were finally reduced by Gen. Wayne, and made peace in 1795. They were now located on the Scioto, though a portion of them were in Missouri on lands obtained from the Spaniards. During the war of 1812 some of them were again won over by the English, and joined with Tecumseh in endeavoring to bring about a general Indian uprising against the Americans. The number of the Shawnees is about 800, on agencies in Indian territory.

SHAYSS REBELLION, under the leadership of Daniel Shays, in w. Massachusetts in 1786-87, involving nearly 2,000 men on the side of the insurgents. The outbreak was occasioned by general popular dissatisfaction at the pressure of taxation, the burdensome salaries of state officials, and the scarcity of money at the close of the revolutionary war. A paper currency issue was demanded, riotous action took place in several counties, and Shays himself, with a considerable body of followers, endeavored to gain possession of the arsenal at Springfield, but was driven off by the militia and a force under command of Gen. Lincoln. Of 150 who were captured, 14 were tried and sentenced to death, but afterward pardoned. Shays was also pardoned, after being hidden away for a considerable period, and retired to Sparta, N. Y., where he died in 1825. He was born in Massachusetts in 1747, was a sergeant at Bunker Hill, and rose to be capt. during the revolution.

SHEA. See **BASSIA**.

SHEA, JOHN D. GILMART, LL.D., b. New York, 1824; educated at the grammar-school of Columbia college, and admitted to the bar, but gave himself chiefly to historical subjects. He produced numerous works, mainly on American history; the most important of which are *The Discovery and Exploration of the Mississippi Valley*; *History of the Catholic Missions among the Indian Tribes of the United States*; *The Fallen Brave*; *Early Voyages up and down the Mississippi*; *The Operations of the French Fleet under Count de Grasse*; *Washington's Private Diary*; translation of Charlevoix's *History of New France*. Dr. S. published Roman Catholic prayer-books and school histories, prepared the *Catholic Almanac*, edited the *Historical Magazine*, and wrote papers for the publications of historical societies. In his department of history he held high rank for accuracy and research. He died in 1892.

SHEAFER, PETER WENRICK, b. Penn., 1819; son of Henry Sheaffer; pursued his early studies at Oxford academy, N. Y. His father introduced the Lykens Valley coal into the market in 1834, and employed him in his mining operations until in 1838 he participated in the first geological survey of Pennsylvania, led by Prof. H. D. Rogers, being especially useful in the vicinity of the Second mountain. In 1848 he took up his residence in Pottsville. He managed the Philadelphia and Reading coal and iron company, and the Girard mines of the city of Philadelphia. He has visited the British provinces and the Deep River coal lands of North Carolina, has given lectures at Lafayette college and other institutions. He was the originator of the first state survey of Pennsylvania in 1849, and the succeeding one in 1873 owed its organization to him.

SHEAFFE, Sir ROGER HALE, 1763-1851; b. Boston; entered the British army in 1778. He served through the war of 1812, commanding the British at the battle of Queenstown after the death of Gen. Brock, and conducting the defense of York (now Toronto). He was made gen. in 1828.

SHEARING-MACHINE, a machine used in the preparation of woven woolen fabrics. See **WOOLEN MANUFACTURES**.

SHEARS of various kinds are among the implements used in gardening. They are scissors on a large scale, variously modified to suit their various purposes, such as pruning trees, hedges, box-edgings, the verges of grass plots, etc. They are often furnished with long wooden handles, and a spring is sometimes fixed between the handles. A kind used for removing small branches of fruit-trees has one blade made to slide along the other while they are brought together, so that it makes a cut as clean and smooth as that of a knife.

SHEAR-STEEL. See **IRON**.

SHEARWATER, *Puffinus*, a genus of *procellariæ* (see **PETREL**), differing from petrels in having the tip of the lower mandible curved downward, and the nostrils opening separately and not by a common tube. The bill is as long as the head, or longer, the upper mandible compressed and curved at the point. The legs are of moderate length, the tarsi compressed, the hind-toe rudimentary. The wings are long and pointed. The shearwaters spend their lives mostly on the ocean, rarely visiting the shore except for the purpose of incubation.—The GREATER, WANDERING, or CINEREOUS SHEARWATER (*P. cinereus* or *major*) is about 18 inches long, the upper parts blackish brown; the throat, breast, and belly gray. Young birds are entirely brown, the upper parts darkest. This species is frequently seen on the s.w. coasts of Britain. It is very abundant on those of Newfoundland.—The MAXX SHEARWATER (*P. Anglorum*) is much more common on the British coasts, and is found also in more northern regions. It is about 14 inches long, grayish black, the neck mottled with gray, the throat and all the under parts white. It breeds on islets, in rabbit-burrows, or in crevices of the rocks.—There are

several other species in warmer climates.—The name shearwater is sometimes also given to the skimmers.

SHEATH-BILL, *Chionis*, a genus of birds of the family *chionidæ*, placed by many naturalists among the *grallæ*, but by others regarded as belonging to the *gallinaceous* order, and ranked by Mr. Swainson among *columbidæ*. The legs are stout and moderately long, the toes much resemble those of the common fowl, but the fore-toes are united at the base. The bill is thick and conical, and the base is covered by a horny sheath, which the bird has the power of raising and depressing. The WHITE SHEATH-BILL (*C. alba*) inhabits the shores of Australia, New Zealand, and neighboring islands, and feeds on mollusks, crustaceans, and whatever animal substance is thrown up by the waves. It is about the size of a partridge.

SHEATHING is a protection for the wooden planking of the immersed portion of a ship from the attacks of the teredo and other worms, mollusks, and marine animals, which, especially in hot climates, adhere to the bottom and eat into the timber, while they retard the vessel's progress. As early as the time of Trajan sheets of lead were used as sheathing. Thin deal boards, about half an inch thick, were in more modern times nailed on and frequently changed; but about the commencement of the present century plates of copper were introduced, which have been found most effectual, though expensive. The gradual oxidation of the copper by the action of the sea-water produces a sort of poison, which prevents any marine animal from adhering, and keeps a clean bottom. The copper, however, slowly wears away in this oxidation, and requires renewing after a few years. To prevent this loss various methods have been devised. Sir H. Davy applied what he called protectors, consisting of pieces of iron and zinc on different parts of the *copper*; the action of the water on the two metals produced a small galvanic current, which prevented the copper from oxidizing; but it became forthwith encased in barnacles and weeds. For ships stationary in harbor, as hulks, ships-in-ordinary, etc., this system of protection answers well; but it fails for sea-going vessels, together with many other protecting mixtures which have been tried, from the fact that in proportion as the copper is saved from oxidation, by so much does it cease to repel the incrustations which always threaten it.

SHEBOYGAN, a co. in e. Wisconsin, on the w. shore of lake Michigan; drained by the Oneon, Mullet, and Sheboygan rivers; traversed by the Wisconsin Central railroad and several branches of the Chicago and Northwestern; about 515 sq. m.; pop. '90, 42,489. Co. seat, Sheboygan.

SHEBOYGAN, city and co. seat of Sheboygan co., Wis.; on lake Michigan at the mouth of the Sheboygan river, and on branches of the Chicago and Northwestern railroad; 52 miles n. of Milwaukee. It contains the Lakeside and St. Nicholas hospitals, an asylum for the chronic insane, a day school for the deaf, home for the friendless, U. S. government building, Fountain, Sheridan, and other parks, soldiers' monument, public library, electric light and street railroad plants, waterworks supplied from lake Michigan, and over 20 churches. The city is particularly noted for its manufacture of chairs, and has also furniture, leather, bicycle, boot and shoe, brick and tile, carriage and wagon, boiler, soap, and stamped steel and cast iron ware works. Pop. '90, 16,359.

SHECH'EM, a city in central Palestine on Mount Ephraim, about 30 m. n. of Jerusalem. It was one of the cities of refuge, and the first capital of the kingdom of Israel. It is called Sychar in the New Testament. After being destroyed in the war with the Romans it was rebuilt in the reign of Vespasian and called Neapolis. On coins still found it is called Flavia Neapolis. Its present name is Nablûs. Pop. about 9000.

SHECHINAH (from *shachan*, to reside, rest), a word used in post-biblical times by the Jews, and adopted by early Christian writers: expressive of the presence of the divine majesty in heaven, among the people of Israel, or in the sanctuary. It is first found used in the Chaldee versions (Targums) as a kind of periphrasis for the person of God, wherever it is mentioned in the Bible as corporeal; thus being a kind of spiritual interpretation of anthropomorphism. The shechinah is not supposed to have dwelt in the second temple, but it is to return with the Messiah. The particular place where the shechinah was supposed to dwell was the "mercy-seat between the cherubim." The cherubim or other angels were always more or less connected with the shechinah itself, as in the phrases "the heavenly hosts," "hosts of saints," etc., accompanying the divine presence. The first mention of the word is found in the Targum Jerushalmi, Gen. iii. 24—"And He expelled Adam, and caused to reside the splendor of his shechinah from the beginning at the e. of the garden of Eden, above the two cherubim." (Second recension: "between the two cherubim.") Another characteristic instance of its use is found in the version of Onkelos, Deut. iii. 24—"Thou art God, Thy divine shechinah is in heaven above, and rules on earth below."

SHEDD, WILLIAM GREENOUGH THAYER, D.D., LL.D., b. Mass., 1820; graduated at the university of Vermont, 1839, and at Andover seminary, 1843; pastor of a Congregational church at Brandon, Vt., 1844-45; professor of English literature in the university of Vermont, 1845-52; of sacred rhetoric and pastoral theology, Auburn seminary (Presbyterian), 1852-53; and of ecclesiastical history, Andover theological seminary, 1851-62:

pastor of the Brick Presbyterian church, New York, 1862-63; professor of biblical literature, Union Seminary (Presbyterian), New York, 1863-74; professor of theology there 1874-91. Among other works he published *System of Rhetoric*; *Philosophy of History*; *Discourses and Essays*; *History of Christian Doctrine*; *Homiletics and Pastoral Theology*; *The Doctrine of Endless Punishment* (1885). As a theologian he was regarded as developing the sterner elements more fully than is common in recent years. Died 1894.

SHEE, Sir MARTIN ARCHER, D.C.L., 1770-1850; b. Dublin. He studied art under F. R. West in Dublin, and in London under sir Joshua Reynolds, to whom he was introduced by Edmund Burke. In 1798 he was made an associate of the Royal Art Academy. He became president of the academy in 1830, and in the same year was knighted. He was a portrait painter of great popularity, though inferior in genius to Lawrence. He published, in 1805, *Rhymes on Art*, a poem praised in Byron's *English Bards and Scotch Reviewers*. His tragedy *Alasco*, 1824, refused a license as treasonable, was printed, but has little or no merit.

SHEEP, *Ovis*, a genus of ruminant quadrupeds of the family *capridæ*, so nearly allied to goats that the propriety of generic distinction is very doubtful. They differ from goats in having the outline of the face more or less arched and convex; the horns spiral, sometimes very large in the males—in domestication, however, often wanting in the females, and also in the males of some breeds; the chin destitute of a beard; a sac or pit between the toes of each foot, lined with hair, and secreting a fatty matter. It is supposed by some that all the wild sheep existing in different parts of the world are mere varieties of one species, but of this there is no sufficient proof, nor is there anything more than unsupported conjecture in any of the opinions advanced concerning the origin of the domestic sheep, such, for example, as that which refers it to the moufflon, or that which ascribes different domesticated breeds to different wild originals, as the moufflon and the argali (q.v.).

All the wild sheep known are natives either of mountainous regions or of dry and elevated table-lands. They are gregarious, a character which the domesticated sheep fully retains. They are generally seen in small flocks, and are not easily approached, taking refuge in flight, a sharp whistling sound, emitted by one of the rams, serving as an alarm to the whole flock; although they are very capable of making a vigorous defense when driven to close combat. A ram of the domestic species is, indeed, able to sustain a conflict with a bull, taking advantage of his far greater agility and butting against his foe with his strongly armed forehead. A ram has been known to throw a bull on the ground at the first onset, and is always ready to defend himself and his companions against a dog. Many rams exhibit great pugnacity. Sheep differ from goats in their mode of fighting. Goats rear themselves on their hind-legs, and throw themselves sideways on their adversary, to bring the points of their horns to bear. Sheep rush straight at each other, a mode which better suits the different style of armature of the head. Rams of the black-faced variety are especially powerful with their heads, and often at the rutting season kill each other. Their naturally strong skull is considerably protected in battle by heavy arched horns. A thorough ram fight is a terrifying sight. The two warriors go backward each some 15 or 20 yards, and then meet each other with great violence, their heads cracking loudly, and their beam-ends rising in response to the collision of heads. Ewes of this breed fight also. Sheep without horns are not so pugnacious as the mountain breeds.

All the wild sheep have short wool, with an outer clothing of long and nearly straight hair. But even the long hair—at least on the moufflon—has the peculiar character of wool, in that roughness of surface which gives it the property of *felting* (see **HAIR** and **FELT**). One effect of domestication in the common sheep has been to cause the disappearance of the outer long hair, and to produce instead an increase of the length and abundance of the wool, an object of great importance to the sheep-farmer. In neglected breeds of the common sheep the two kinds of hair or wool are very apparent. In some tropical climates the sheep loses its abundant fleece, and is covered with hair little longer than that of the ox.

Although not equal to goats in their adaptation to rocky steeps, and not endowed with such power of leaping from crag to crag, most breeds of sheep exhibit a strong disposition to seek their food in places where no animal not very agile and sure-footed could venture; and those of the domesticated breeds which retain much of their original wildness are thus adapted to situations in which otherwise the pasture would be of little value to man. Every one who has seen the lambs frisking on a Highland hill, in a fine evening, must have admired their nimble movements in places where a herd-boy could with difficulty scramble. In fine weather sheep ascend the heights; and in cold and stormy weather they repair to the lower grounds. In modern times it has been customary to remove the large flocks from mountainous regions to lower grounds to pass the winter; and in the fall of the year shepherds have difficulty in preventing the animals from leaving the summer pastures too early if the weather is unfavorable. On the other hand, if fine spring weather sets in before the period of removal from the winter quarters, the flocks keep pressing toward the summering regions. Mountain sheep have favored spots whither they go regularly over night, and the ewes generally have choice localities to which they go to lamb. They get much attached to certain pastures, and

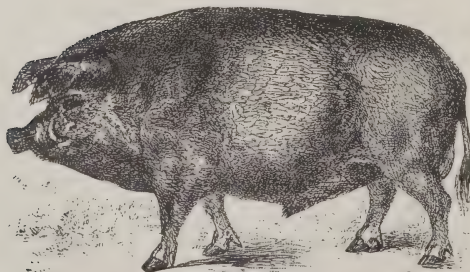
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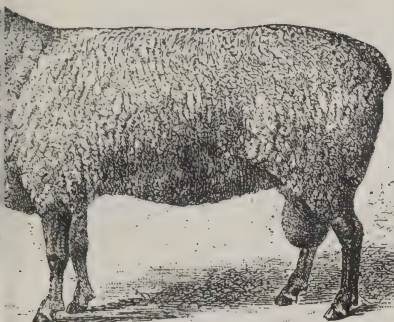


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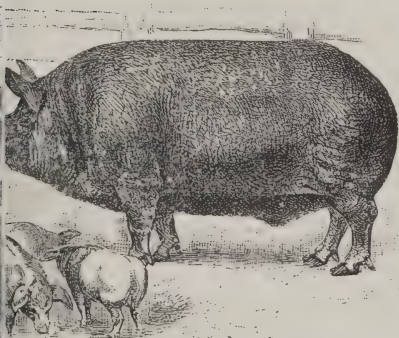
SHEEP.—1. South African. 2. Southdowns. 3. Disley. 4. Negrettis and Rambouillet. 5. Mask-hog.



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Swine: 5. Yorkshire. 6. Suffolk. 7. Berkshire sow. 8. Essex boar. 9. Szalonta.

many of them have been known to return stealthily, in the course of a few days, to their native or appreciated pastures, though removed some hundreds of miles.

A very interesting species of the wild sheep is the **ROCKY MOUNTAIN SHEEP**, or **BIG-HORN** (*O. montana*), of North America. It is equal in size to the argali, which it much resembles also in its general appearance, and in the size and curvature of its horns. The horns of the old rams attain so great a size, and are so much curved downward and forward, that they often effectually prevent the animal from feeding on level ground. The abode of this species is in the most craggy and inaccessible parts of the Rocky mountains. The flesh is of the very finest quality. The wool is very fine, and fully an inch and a half long; it is completely concealed by long hairs. The general color is brown, paler on the lower parts; the old rams are almost white in spring. The **AOUDAD** (*O. tragelaphus*) is a native of the n. of Africa, inhabiting chiefly the lofty parts of the Atlas mountains. It is sometimes called the bearded argali, although it has no beard on the chin; but the throat, the chest, and the front of the forelegs are remarkably adorned with long shaggy hair. On other parts the hair is comparatively short, with an underclothing of short wool. The color is a uniform reddish-yellow. The tail is longer than in the other wild species, and is terminated by a kind of tuft of long hairs. The horns are not so large as in the other wild species. In size, the aoudad exceeds the moufflon, but is not equal to the argali. The French call it *moufflon a mouchettes*, or ruffled moufflon, from the long hair of its forelegs.

The **COMMON SHEEP** (*O. aries*) was probably the first animal domesticated by man. We are told in the book of Genesis that Abel was "a keeper of sheep," and that he brought an offering unto the Lord "of the firstlings of his flock and of the fat thereof." And from that time until the death of Christ, lambs continued to be the most frequent sacrificial offerings, both among the patriarchs and the Jews. The felting and weaving of wool were unquestionably among the earliest of the arts. The wool was probably at first pulled from the skin, a rude and even cruel practice, which it is said still subsists in some countries, and was not very long ago relinquished in the Orkney islands. We read in Genesis xxxviii. of Judah shearing his sheep, and there is abundance of other evidence that the better mode of obtaining the fleece has been in use from remote antiquity. The leather made of the skin of the sheep is much employed in bookbinding, and for making gloves. In patriarchal times, the milk was much used, as it still is in some countries; it is richer than cow's milk, and the cheese made of it has a sharp taste and strong flavor, which, however, are greatly relished by some. In Britain the milk is now very little used. In some mountainous parts of India the sheep is even used as a beast of burden, carrying loads of from 35 to 40 pounds, over rough tracks, and up steep crags, where almost no other animal could be employed.

Those who watch sheep carefully, or keep them as pets, find them by no means devoid of intelligence. They have, however, a stupid habit of following, without scruple, the leader of the flock; so that, when sheep are being driven across a narrow bridge, or where a fence separates the road from a precipice, if anything occur to deter them from proceeding in the proper path, and one break over the fence or parapet, more of the flock may be expected to follow, as has sometimes happened, to their utter destruction. Sheep very soon come to know the voice of the shepherd, and also the appearance as well as the bark of the shepherd's dog. Though they stand more in awe of the shepherd's voice or commands than of any other human being's, the dogs regularly moving among them fail to keep them in such subjection as strange ones do.

The "rutting" is from September till the middle of December, according to the variety of sheep and the system of feeding. White-faced modern breeds have the tups early among them, and the hill flocks are later. The period of gestation is from 20 to 21 weeks. Ewes occupying sown or low-ground pastures lamb in March, while those not so well provided for—the mountain sheep—do not drop their lambs usually till April. The ancient breeds generally have only one lamb in a season, but modern highly fed varieties frequently have twins, occasionally triplets, but rarely more. Lambs intended to come early into the market are as often as possible dropped in January. Generally lambs are weaned in July and August. Weaning of breeding or store lambs, however, is a feature of modern sheep-farming; at one time it was not uncommon to see several generations persistently following the parent stem. The shearing season ranges from May 1 till the middle of July, according to the description of sheep, the nature of the feeding, etc. Autumn is the most common time for the "dipping," "juicing," or "smearing" of the flocks, to kill vermin, prevent skin disease, and preserve and cultivate the wool crop.

The great object for which the ancient Britons possessed sheep before the Roman invasion was the production of wool. The demand for butcher-meat has now raised the value of mutton and lamb so much that the farmer finds it profitable to devote much of his attention to supply the market with these articles; and those breeds of sheep are reckoned most valuable which are most suitable for this purpose, even although the quality of the wool is inferior. When there was no food for sheep but the natural pasture, the animals could not be fattened for the market except during summer, and not until they had attained an age of three, four, or five years; whereas much of the mutton now consumed is the flesh of sheep not more than two years old, fattening being aided by turnips, mangold, oil-cake, etc.

The young branches of heath, and in lower situations, the shoots of furze, often serve as food for sheep, when the supply of grass fails. Sheep delight in short grass and peculiar herbage of hill pastures and bare downs; and the mutton produced in such pastures, and by the breeds most suitable to them, is of superior quality to that of the large fat sheep fed on richer soils. The latter are also more liable to many diseases, particularly where the ground is at all moist. Aromatic and bitter herbs are particularly relished by sheep.

The breeds of sheep are very numerous, and very different.—The **BLACK-FACED SHEEP** of the Highlands of Scotland and of the north of England is perhaps as near the original type as any existing breed. Both male and female have horns; those of the ram large, with two or more spiral twists, those of the ewe much smaller, and little twisted. The face and legs are not always black. Many are speckled, and some principally white. The black-faced sheep is robust, very active, and hardy; enduring the rigors of a severe winter when sheep of most of the breeds common in Britain would perish. It survives on little food, and shifts admirably for itself in a snow-storm. The small quantity, and even inferior quality, of food with which a black-faced sheep will tide over a snow-storm is most surprising. As an instance of the tenacity of life in black-faced sheep, under certain circumstances, they have been known to be buried five weeks under a snow-wreath and come out alive. It has a bright, quick eye, with an expression very different from that softness which is seen in many of the breeds preferred for lower grounds and better pastures. The wool is long and coarse, and the weight of the fleece from 3 to 4 pounds; but the mutton is of the finest quality; and on this account, and its hardness, this breed is preferred to any other in many mountainous districts and on rough elevated moors.—The **WELSH SHEEP** is much smaller than the black-faced; both sexes horned; the color various; the mutton highly esteemed; the fleece seldom weighs 2 pounds.—A very little larger breed with big bushy tail, hornless, or with short and little twisted horns, has long existed in the Shetland and Orkney islands; its wool affording the material for the manufacture of Shetland hose. The Shetland and Orkney sheep are very hardy, and in winter feed much on seaweed.—Smaller than either of these, and, indeed, remarkably diminutive, is the hornless **BRETON SHEEP**.—The **FOREST SHEEP** of England, so called from being pastured in the royal forests, has now in most places been supplanted by other breeds. They are still to be seen on the barren grounds between the British and Bristol channels; and the mutton is in much request in the London market. The original forest sheep was generally small, with face and legs russet brown or gray, wild, restless, and difficult to fatten, but producing wool of fine quality.—The **DORSET SHEEP** is one of the best of the old English upland breeds. Both sexes have small horns. The wool and mutton are of medium quality; but the ewes are remarkable for their fecundity, and the abundance of their milk; and this breed is valued as affording a supply of early lamb for the London market.—The **RYELAND SHEEP** has long existed in Herefordshire and some neighboring counties of England. It is small, short-limbed, white, hornless; produces excellent mutton; and before the introduction of merino wool, its wool was preferred to every other kind for the manufacture of the finest broadcloths.—The **CHEVIOT SHEEP** has existed from time immemorial on the Cheviot hills, and is now very widely diffused over a considerable part of England and almost all parts of Scotland, being hardy and well adapted for high grounds, although it is inferior in hardness to the black-faced. Cheviots, however, rather excel the black-faced both in size and in the value of the fleece; but require a richer pasture. Ewes are hornless, and the rams almost so. The general figure is longer than that of the black-faced sheep. They are narrow in shape, with slender forequarters and long pricked ears. The color is white, the face and legs occasionally mottled with gray, but generally quite white. The fleece weighs from 3 to 5 pounds. Great attention has for many years been devoted to the improvement of this breed.—The **LEICESTER SHEEP** is another of the most valuable breeds. This breed, as it now exists, is a result of the skill and care of Mr. Bakewell, who, soon after the middle of last century, began to make experiments for the improvement of the old Leicester sheep—a large, coarse-boned sheep, not easily fattened, and with coarse long wool, of which, however, the fleece weighed from 8 to 10 pounds. The new Leicester sheep has wool moderately long, of better quality, the average weight of the fleece being about 7 or 8 pounds, and is easily rendered very fat. It is naturally very broad on the back, with finely arched ribs. The color is white. Both sexes are hornless. The Leicester sheep is now common in all but the mountainous parts of Britain, and other breeds have been improved by crossing with it, particularly various breeds of long-wooled sheep, which have long existed in different parts of England, as those of Lincolnshire, Romney Marsh, etc.—A famous long-wooled breed is that called the **COTSWOLD** or **GLOUCESTER**, the wool of which was in great esteem in the 14th and 15th centuries, bearing a higher price than any other wool. In 1464 Edward IV. sent a present of Cotswold rams to Henry of Castile; and in 1468 a similar present was sent to John of Aragon. The Cotswold breed, however, as it at present exists, has been modified by crossing with the Leicester, and produces shorter wool and better mutton than in former times.—The **SOUTH DOWN SHEEP** has recently been improved with the utmost care. The color is generally white, and the face and legs are generally dun, black, or speckled. Both sexes are hornless. The wool is short, very close, and curled. The south down derives its

origin and name from the chalky *downs* of the south of England; but is now met with throughout England and the south of Scotland. The Shropshire sheep are large, with thick wool something like the south down. They are hornless, and black or dun in the face and legs. They come early to maturity, but are suited only for finer climates and good keep. The Oxford down is a heavy, somewhat soft sheep, without horns, and capable of rapid and great development under good treatment. It is not suited to very cold and exposed situations.

The ICELAND SHEEP is remarkable for very frequently having three, four, or five horns. They are good butchers' animals, being deep and thick in the carcass, though rather short in the quarter. The same peculiarity, or monstrosity, as it may be deemed, is exhibited by the sheep of some of the most northern parts of Russia. The n. of Africa possesses a breed of sheep with legs of great length, pendulous ears, and much arched face; the wool short and curled, except on the neck and shoulders, which have a kind of mane. India has also a hornless breed, with pendulous ears, short tail, and very fine much-curled wool. The BROAD-TAILED or FAT-TAILED SHEEP is found in many parts of Asia, as in Syria, India, and China, also in Barbary, and is now very abundant in the colony of the cape of Good Hope. It is rather of small size, with soft and short wool. Its chief characteristic is the enormous development of the tail, by the accumulation of a mass of fat on each side, so great that the tail has been known to weigh 70 or 80 lbs. The tail is highly esteemed as a delicacy, and to protect it from being injured by dragging on the ground, the shepherd sometimes attaches a board to it, or even a small carriage with wheels. The fat of the tail is often used instead of butter. It is less solid than other fat. The FAT-RUMPED SHEEP of southern Tartary has a similar accumulation of fat on the rump, falling down in two great masses behind, and often entirely concealing the short tail. The ASTRAKHAN or BUCHARIAN SHEEP has the wool twisted in spiral curls, and of very fine quality. The Circassian sheep has a remarkably long tail, covered with fine long wool, which trails on the ground. The WALLACHIAN SHEEP, common in Hungary, as well as in the country from which it derives its name, is distinguished by the magnitude of its horns, and their direction. They make one great spiral turn, and then generally rise up from the head to a great height, twisting round as they rise. The wool is soft, and is concealed by long hair.

Sheep were first introduced into the American colony of Jamestown, Va., in 1609, and into New York and Massachusetts about 1625. Within 40 years the number in the colonies had increased to 3,000. The breeds generally esteemed the best in the United States are the Vermont Brewer and Atwood flocks; though the French, Saxon, and Spanish merinos are favorites with some. The Leicester breed is considered the best for the farmer, being heavy in carcass and full in yield of wool. Southdowns are preferred for their mutton, and the Cotswold is highly considered. The total number of sheep in the United States in 1890 was 44,336,072, according to the report of the secretary of agriculture. The largest number in any one state was 4,752,640 in Texas, and the smallest number, in Rhode Island, 20,231. There were 4,035,120 in Cal.; 3,092,736 in New Mex.; 3,943,589 in Ohio.

SHEEP-LOUSE, or SHEEP-TICK, or (in Scotland) KAID, *Melophagus ovinus*, an insect of the family *hippoboscidae*, to which also the forest-fly belongs, ranked in the order *diptera*, although in this genus the wings are completely wanting. It lives among the wool of sheep, and particularly of lambs, sucking the blood of the animal, and is most abundant in the early part of summer. Where it fixes its head in the skin a large round tumor is formed. Its body is very compressed and smooth, of a rusty color, the head and thorax small, the abdomen large. The female does not lay eggs, but, like the other *hippoboscidae*, hatches the egg and nourishes the larva within her own body, till it passes into the pupa state, when it is deposited, oval-shaped and shining, fastened to the wool of the sheep. Sheep-farmers use various washes or *dips* for the destruction of these creatures, many of which are arsenical. A patent was obtained a few years since for a sheep-dip, of which carbolic acid is a principal ingredient. The sheep-louse is not a tick proper. See TICK.

SHEEPSHEAD BAY, or THE COVE, a village in Kings co., N. Y., on the bay from which it is named, 2 m. n.e. of Coney Island. The Coney Island Jockey Club has a mile track here, with a handsome façade at the entrance, grand-stand, judges' stand, etc., in the "Queen Anne" style, erected 1880. Race meetings are held in June and Sept. There are also a church, cottages and boarding-houses for summer residents.

SHEEP'S-HEAD, *Sargus ovis*, a fish of the family *sparidae*, plentiful in the latter part of summer on some parts of the coast of North America, and highly esteemed for the table. It sometimes attains a weight of 14 or 15 pounds. A very large fish is sometimes sold in the New York market for a price equal to four or five pounds sterling. The fishery is therefore of some importance. Nets are used, and many fish are often taken at a single haul, which are immediately packed in ice for the market. It is difficult to take the sheep's-head with a line, as its cutting teeth snap the line asunder. The genus *sargus* has cutting front teeth, and round teeth in the back of the mouth. *S. rondeletii* inhabits the Mediterranean, and has been esteemed for the table from ancient times. The *sargi* feed on shell-fish and the smaller crustaceans, which they easily crush with their round teeth; partly also on sea-weeds.

SHEERAZ. See SHIRAZ.

SHEERNESS', a seaport and naval arsenal in the co. of Kent, stands on the n.w. extremity of the Isle of Sheppey, at the confluence of the Thames and Medway, 11 m. e.n.e. of Chatham. It consists of four divisions, Blue-Town, Mile-Town, Marine-Town, and Westminster, and of these the first is within the limits of the garrison. The dock-yard, much extended and improved within recent years, is now one of the finest in Europe. It covers 60 acres, comprising wet and dry docks, immense storehouses, official residences, and the naval barracks. The harbor is usually crowded with vessels of all descriptions. It is sheltered, and there is deep water even at low tide. An extensive oyster-fishery is carried on in the vicinity. At Garrison point is the residence of the port-admiral, the telegraph, coast-guard station, and military barracks. The chief trade is in supplying the requirements of the employees in the various government establishments, and in the export of corn, seeds and oysters. The beach and cliffs are a favorite resort for ramblers. Pop. '91, 13,841. Sheerness was captured by the Dutch under De Ruyter in 1667, and here the mutiny of the *Nore* burst forth in 1798.

SHEERS. The elemental form of a pair of sheers consists in two spars fastened together near the top, with a pulley at the point of junction, and held by a rope, fastened to any convenient object, in such a position that the weight lifted hangs nearly between the spars. This forms an easily improvised crane. An apparatus of this kind, of great height and strength, is used for masting vessels. In the principal dock-yards there are tall permanent sheers, mounted either on the side of a masting-dock or on a floating sheer-hulk.

SHEET, on ship-board, is the rope by which each of the lower corners of a square-sail, or the after-corner of a fore-and-aft sail, is held down in order that the sail may be tightened to the wind.

SHEETING, a cloth made of flax or cotton, and used for bed-linen. It is chiefly made in Ireland in or near Belfast, and in Scotland. The term sheeting is also applied to the coarse hempen cloth used for making tarpaulins (q.v.).

SHEFFIELD, a city in Colbert co., Ala.; on the Tennessee river, and the Louisville and Nashville, the Memphis and Charleston, and the Northern Alabama railroads; 124 miles n. w. of Birmingham. It was founded in 1884; contains several large blast furnaces, the main shops of the Memphis and Charleston railroad, cotton compress, and several wood manufacturing plants; and has electric lights, water supply from the river, several churches, and weekly newspapers. Pop. '90, 2731.

SHEFFIELD, a town in Berkshire co., Mass.; on the Housatonic river and the New York, New Haven, and Hartford railroad; 31 miles s. of Pittsfield. It was incorporated in 1733; contains the villages of Sheffield and Ashley Falls; has a high school, free town and Friendly Union libraries, memorial hall, and several churches; and is principally engaged in farming, dairying, and marble and limestone quarrying. Pop. '90, 1954.

SHEFFIELD, a manufacturing t., parliamentary and municipal borough and city; in the West Riding of Yorkshire; it is picturesquely situated on several hills that slope toward the confluence of the rivers Sheaf and Don, 165 m. n.n.w. of London, with which it is connected by the Great Northern and Midland railways, and 41 m. e. of Manchester. Within its limits there are five parliamentary divisions, namely, Attercliffe, Brightside, Hallam, Eccleshall, and Central. The town generally is well built, its appearance having been greatly improved since 1875 by important public works, carried out at great expense. It possesses many fine public buildings, such as the original parish church, supposed to have been erected in the reign of Henry I., 240 ft. long by 130 ft. broad; St. Mary's Catholic church, surmounted by a tower 200 ft. high; the town-hall (erected 1891); cutlers' hall; corn exchange; the new market-hall, or Norfolk market, with a roof of glass and iron, erected by the Duke of Norfolk; music-hall, assembly rooms, theaters, etc. There are extensive botanic gardens, and a fine cemetery about a mile from the town; many churches; numerous educational establishments, such as the free grammar school, the collegiate school, the Wesley college, a Lancasterian and many national schools, free writing-schools, school of art, besides denominational schools, etc.; also a mechanics' institution, established in 1832. The mechanics' library (1828) is now merged into the free library, and there is also the Sheffield library. There are likewise many charitable institutions. As far back as the time of Chaucer, Sheffield was noted for the manufacture of cutlery; and at the present day an endless variety of articles in brass, iron, and steel is produced at the many manufactories with which the town abounds,—such as knives of every description, silver and plated articles, britannia-metal goods, coach-springs, spades, spindles, hammers, files, saws, boilers, stoves, grates, buttons, bicycles, etc. In March, 1864, a new embankment, constructed for the Sheffield water company, at Bradfield, gave way, and let out a body of water 95 ft. high from a reservoir 73 acres in extent. The destruction of life and property by this flood was unprecedented in England: 250 persons perished; mills, houses, and hamlets were swept away from their foundations, and, apart from the ruin of the Bradfield dam, damage was done to private property to the extent of close upon £300,000. In 1866, trade outrages, in the form of "rattening"—a local name for the stealing of tools and wheel-bands—and of unscrupulous treatment of the lives and limbs of non-union men, which had for more than twenty years been a disgrace to Sheffield, were brought to a prompt check by a royal commission, procured, among other influences, by the loyal outspokenness of the local

press. Two fine churches have been recently erected—All Saints, a cruciform, early second pointed edifice, in 1867; and Sharrow church, of the late first French pointed period, in 1868. Since 1871 the introduction of the manufacture of armor-plates, railway-springs, tires, and rails have given a remarkable impetus to the growth of the town. The Albert hall, erected in 1873, is a commodious building which seats 3000 people. Five members are returned to parliament. Pop. '94, 338,316.

SHEFFIELD, JOSEPH EARLE, 1793-1882; b. Southport, Conn.; d. New Haven. When fifteen years old he entered commercial life at Newberne, N. C.; he afterwards removed to Mobile, Ala., and became one of the largest cotton shippers in the country. He returned to Conn., 1835, and became largely interested in railroad operations. For many years he was pres. of the New Haven and Northampton railroad. He gave upward of \$700,000 to educational purposes, and founded the Sheffield scientific school at Yale.

SHEFFIELD SCIENTIFIC SCHOOL. See YALE UNIVERSITY.

SHEFFORD, a co. in s.w. Quebec, intersected in the s. by the Stanstead, Shefford and Chambly and the Canadian Pacific railroads; 555 sq. m.; pop. '91, 23,263. It is drained by the Yamaska river in the s.e., and the Black river in the north. Co. seat, Waterloo.

SHEIK (Arab. elder, aged person), a title of reverence, applied chiefly to a learned man, or a reputed saint, but also used sometimes as an ordinary title of respect, like the European Mr., Herr, etc., before the name. It is, however, only given to a Moslem. The sheik Al-Islam is the chief mufti (q.v.) of Mohammedanism at Constantinople; a title supposed to have been first assumed by Mohammed II. at his conquest of Constantinople in 1453, when this place became the seat of his empire. The sheik of Mecca, by virtue of his supposed descent from the prophet, levies a kind of tribute on all the pilgrims to the Kaaba. The term is also applied to heads of Mohammedan monasteries (our abbot or prior), and to the higher order of religious preachers. Sheik Al-Gebal (ancient of the mountain) is the name of the prince of the assassins (q.v.), or those Ismaelites of Irak, who undertook to assassinate all those whom their chief would pronounce to be his enemies.

SHEIL, RICHARD LALOR, 1791-1851; b. Waterford, Ireland; graduated at Trinity college, Dublin; studied law and was called to the bar in 1814. For eight years he occupied himself chiefly in writing several successful dramas, of which *The Huguenot* was the best and the least popular. In 1822 was printed the first of his *Sketches of the Irish Bar*, a keen and witty picture of the life and manners of the time, published collectively in 1855. The same year he joined the "Catholic association," and in 1825 was sent to oppose its suppression as joint advocate with Daniel O'Connell before parliament. He soon became known as a political agitator and brilliant orator; was elected to parliament in 1829; aided O'Connell in the repeal agitation, but, changing his position, took office under the Melbourne ministry, and in 1850 was sent to the Tuscan court as British ambassador.

SHEK'EL (*sheklos*, from *shakal*, to weigh) originally a certain standard weight in use among the ancient Hebrews, by which the value of metals, metal vessels, and other things was fixed. Gradually it became a normal piece of money, both in gold and silver, marked in some way or other as a coin, although not stamped. The gifts to the sanctuary, the fines, the taxes, the prices of merchandise, are all reckoned in the Old Testament by the shekel, not counted but weighed. Three different kinds of gold, silver, and copper shekels are mentioned: the common shekel, the shekel of the sanctuary (probably of double value), and the shekel of royal weight. Besides these, there was a half-shekel (*beka*), and a fourth shekel. The sacred shekel was equal to 20 geras (beans), and 3,000 sacred shekels made a talent. The gold shekel is reckoned approximatively to contain 161 Troy grains, the silver shekel 275. During the Babylonian exile, the Persian money (*dariks*) was used by the captives; nor do they seem to have afterward used any but the coin of their foreign rulers. It was first under the Maccabæans that national money began to be struck, adorned with sacred emblems, and with inscriptions in the native language and characters. De Sauley alone assumes, without much show of reason, Jewish coins to have existed from the time of Alexander the great. Simon, the "prince and high-priest," received, according to 1 Macc. xv. 16, the permission from Antiochus VII. to strike coin in 138 B.C. The emblems are sacred branches, sheaves, flowers, vases, etc., and the legend (in a peculiarly archaic ["Samaritan"] alphabet) contains the date, the name of the Jewish ruler, and the inscriptions "Shekel of Israel," "Jerusalem the Holy," "Redemption of Israel." The latest coins with Hebrew inscriptions date from the revolution of Bar Cochba under Hadrian. The value of the silver shekel is reckoned to be something over two shillings.

SHEKINAH. See SHECHINAH.

SHELBURNE, a co. in s.w. Nova Scotia, having the Atlantic ocean for its s. and s.w. boundary; 945 sq. m.; pop. '91, 14,956. It is drained by the Clyde, the Jordan, and other rivers. The surface is level. Co. seat, Shelburne.

SHELBURNE, WILLIAM PETTY FITZ-MAURICE, Earl of, son of the first earl, and descendant of sir W. Petty, founder of the science of political arithmetic, was b. May, 1737, and commenced his political career in 1761 by entering the house of commons as member

for Wycombe, but only sat for a few weeks, the death of his father having called him to the house of lords. When Mr. G. Grenville succeeded Bute in 1763, Shelburne, whose talents had made him remarked, although only 26, was placed at the head of the board of trade. When Chatham formed his second administration in 1766, he made Shelburne one of the secretaries of state, although not yet thirty. Upon the fall of lord North's ministry in 1782, George III. sent for Shelburne, and proposed to him to form a government. He declined, not being the head of a party, and was sent by the king to the marquis of Rockingham with an offer of the treasury, himself to be one of the secretaries of state. According to earl Russell, in his *Life of C. J. Fox*, it soon appeared that Shelburne was not so much the colleague as the rival of lord Rockingham, the chosen minister of the court, and the head of a separate party in the cabinet. Upon the death of Rockingham in 1782, the king sent at once for Shelburne, and offered him the treasury, which he accepted without consulting his colleagues. Fox thereupon resigned, and Shelburne introduced William Pitt, then only 23, into office as his chancellor of the exchequer. Shelburne's ministry, on the occasion of the king's announcement of his determination to concede the independence of the American colonies, found itself outvoted by the coalition between Fox and lord North. He resigned, and the coalition ministry took his place, but soon broke up. The nation expected that the king on this event would send for Shelburne, but William Pitt received the splendid prize, and Shelburne was consoled by the coronet of a marquis (of Lansdowne). During the latter years of his life his health was delicate, and he withdrew from public life; but he came forward as a strong supporter of the union with Ireland. He indulged his tastes in the adornment of Lansdowne house. Here he collected a splendid gallery of ancient and modern pictures, together with a library of 10,000 volumes, comprising the largest collection of pamphlets and memoirs on English history and politics possessed by any man of his time, as well as a series of MSS., which were sold to the British museum for £5,000. He was a discerning patron of genius. It was while he resided in Lansdowne house as the librarian and friend of Shelburne that Priestley made the discovery of oxygen. Jeremy Bentham was one of his most intimate friends. Shelburne was the patron and friend of sir S. Romilly, and twice offered him a seat in parliament. He was also on terms of intimacy with Mirabeau, Dumont, and other foreigners of literary and political distinction. He died in May, 1805. See *Life of Shelburne*, by lord Edmond Fitzmaurice (London, 1875-76).

SHELBY, a co. in central Alabama, having the Coosa river for its e. boundary; 772 sq. m.; pop. '90, 20,886, chiefly of American birth, inclu. colored. It is intersected by branches of the Louisville and Nashville and the Southern railroads. It is drained on the n.w. by the Cahawba river. Its surface is varied by hill and valley, well wooded with forests of oak, pine and hickory. Its mineral products are coal and iron ore. Its agricultural products are grain, sweet potatoes, cotton, tobacco, and live stock. Its manufactures are cotton, thread, pig and cast iron, and lime. Co. seat, Columbiana.

SHELBY, a co. in s. central Illinois; drained by the Kaskaskia, Little Wabash, and Sangamon rivers; traversed by the Cleveland, Cincinnati, Chicago, and St. Louis, the Baltimore and Ohio Southwestern, the Illinois Central, and other railroads; 776 sq. m.; pop. '90, 31,191, chiefly of American birth. Surface partly prairie and partly forest; wheat, oats, corn, hay, sorghum, and pork are the staples; there are 6 carriage factories, 2 brick yards, and many flour and saw mills. Co. seat, Shelbyville.

SHELBY, a co. in s.e. central Indiana; watered by Blue river and Sugar and Flat-rock creeks; crossed by the Cleveland, Cincinnati, Chicago, and St. Louis, the Pittsburg, Cincinnati, Chicago, and St. Louis, and the Cincinnati, Hamilton and Dayton railroads; about 400 sq. m.; pop. '90, 25,454, chiefly of American birth. The surface is mostly prairie or woodland. The soil is fertile. The principal productions are corn, wheat, oats, and cattle. Co. seat, Shelbyville.

SHELBY, a co. in w. Iowa, drained by the Nishnabotona river and Boyer and Mosquito creeks; 576 sq. m.; pop. '90, 17,611, chiefly of American birth, with colored. The Chicago, Rock Island and Pacific railroad crosses the extreme s.w. portion. Its surface is varied by rolling prairies, furnishing excellent pasturage and long stretches of woodland. The soil is fertile, producing maize, wheat, and oats. Live stock is extensively raised. Co. seat, Harlan.

SHELBY, a co. in n. Kentucky, watered by branches of the Kentucky river; on the Louisville and Nashville, the Chesapeake and Ohio, and the Southern railroads; about 405 sq. m.; pop. '90, 16,521, includ. colored. The surface is rolling and heavily wooded. The soil is fertile. The principal productions are corn, wheat, oats, and cattle. Co. seat, Shelbyville.

SHELBY, a co. in n.e. Missouri; drained by the n. fork of Salt river, by North Two river, and the South Fabius river; 514 sq. m.; pop. '90, 15,642, chiefly of American birth, with colored. It is intersected in the s. by the Hannibal and St. Joseph railroad. Its surface is undulating and thinly timbered. The soil is fertile, producing corn, oats, sorghum, and live stock. Its mineral products are limestone and bituminous coal. Co. seat, Shelbyville.

SHELBY, a co. in w. Ohio; drained by the Miami river and Loramie's creek; traversed by the Cleveland, Cincinnati, Chicago, and St. Louis, and the Cincinnati, Hamilton and Dayton railroads, and by the Miami canal; 420 sq. m.; pop. '90, 24,707, chiefly of American birth, with colored. Surface, rolling and productive; corn, oats, wheat, hay, and pork are the staples. Co. seat, Sidney.

SHELBY, a co. in s.w. Tennessee, adjoining Mississippi; bounded on the w. by the Mississippi river; drained by Wolf river and Elk creek; crossed by the Illinois Central, the Little Rock and Memphis, the Louisville and Nashville, the Kansas City, Fort Scott, and Memphis, and several other railroads; about 728 sq. m.; pop. '90, 112,740, chiefly of American birth, with colored. The surface is level and heavily timbered. The soil is fertile. It is the largest cotton-growing county in the state. Co. seat, Memphis.

SHELBY, a co. in e. Texas, having the Sabine river for its e. boundary, separating it from the state of Louisiana; 800 sq.m.; pop. '90, 14,365, chiefly of American birth, inclu. colored. It is drained by the Attoyac river, which forms part of its w. boundary. Its surface is rolling and largely covered with forests. Co. seat, Centre.

SHELBY, ISAAC, 1750-1826; b. Md.; was a surveyor in western Virginia; lieutenant at the battle with the Indians at Mount Pleasant, Va., in 1774; capt. of a military company in Virginia in 1776, and in 1777 appointed commissary; was elected to the house of delegates, Virginia, in 1779, and commissioned maj. by Gov. Jefferson, and the following year made col.; fought at the battle of King's Mountain, and in 1780 received for his bravery a vote of thanks and a sword from the legislature of North Carolina, to which he was chosen a member in 1781; settled in Kentucky and was governor, 1792-96, and again, 1812-16. With 4000 Kentuckians he aided Gen. Harrison at the battle of the Thames, and received a gold medal from congress.

SHELBYVILLE, city and co. seat of Shelby co., Ind.; on the Big Blue river and the Cleveland, Cincinnati, Chicago, and St. Louis and the Pittsburg, Cincinnati, Chicago, and St. Louis railroads; 26 miles s.e. of Indianapolis. It is in a fertile agricultural region, and has national banks, daily and weekly newspapers, several churches, saw, planing, and flour mills, manufactories of carriages, furniture, ice, and barrels, and a large general trade. Pop. '90, 5451.

SHELDON, a township in Beaufort co., S. C. Pop. '90, 5979.

SHELDON, GILBERT, D.D., 1598-1677; b. England; graduated at Trinity college, Oxford, 1617; became fellow of All Souls' college in 1622; vicar of Hackney in 1633, and rector of Ickford and Newington; was chaplain to Charles I. in 1635; became bishop of London in 1660, archbishop of Canterbury in 1663, and chancellor of Oxford university in 1667.

SHE' LIF, the chief river of Algeria (q.v.).

SHELL. This term is employed to designate the hard outer coverings of a large number of invertebrate animals. Shells are met with in the *echinodermata*, in the great majority of the *mollusca* (excluding the molluscoids), in a few of the *annelida*, as *Serpula*, *Spirorbis*, etc., in the *cirropoda*, and in the *crustacea*. The forms of the different varieties of shells are sufficiently noticed in the articles on the classes of animals to which they respectively belong; and we shall confine our remarks to the intimate structure of shell, which, until the publications of Carpenter, Rainey, and others, during the last quarter of a century, was altogether misunderstood. The doctrine formerly held, and still maintained in many popular hand-books of conchology, was, that shell is not only extravascular (or devoid of vessels), but completely inorganic, being composed of an exudation of calcareous particles (chiefly carbonate of lime) cemented together by a kind of animal glue. It is now known that shell always possesses a more or less distinct organic structure, which in some cases resembles that of the *epidermis* of the higher animals, while in others it approximates to that of the *derma*, or true skin. The nature of the organic structure is so different in the *echinodermata*, *mollusca*, and *crustacea*, that a separate description is required for each, and as Dr. Carpenter remarks: "Even in the subordinate divisions of these groups, very characteristic diversities are frequently observable, so that, as in the case of the teeth, it is often possible to determine the family, sometimes the genus, and occasionally even the species, from the inspection of a minute fragment of a shell, as well fossil as recent."

In the *echinodermata*, the elementary structure of the skeleton exhibits the appearance of a net-work composed of calcareous and animal matter intimately united. The diameter of these apertures or meshes of net-work varies to a certain degree in different parts of the same shell, the openings being larger in the inner than the outer layers, the extremes being $\frac{1}{150}$ and $\frac{1}{250}$ of an inch. The entire shell is made up of an immense number of such plates, which lie parallel to one another, separated by minute vertical pillars.

In the *mollusca*, the shell is formed upon the surface of the mantle, which corresponds to the true skin of other animals. Hence it must be regarded as epidermic. It consists of cells consolidated by a deposit of calcareous salts in their interior, but, as in the case of many other tissues, the original cellular organization often becomes so hidden by subsequent changes, as to cease to be recognizable. The typical condition of the shell in this sub-kingdom is best seen in certain bivalves—the genus *pinna*, for example.

On breaking off a small portion of the projecting margin of one of these shells, and examining it under the microscope, it is found to be made up of a vast number of prisms, hexagonal in form and nearly uniform in size, which are arranged perpendicular to the surface of the lamina of the shell, so that the thickness of the lamina is formed by their length, and its surfaces by their extremities. On submitting such a lamina to the action of a dilute acid, the calcareous salts are dissolved, and a membrane is left which shows the prismatic structure as perfectly as it was seen in the original shell, the hexagonal divisions being evidently the walls of cells resembling those occurring in the pith or bark of a plant. It sometimes happens in recent, but more commonly in fossil shells, that the animal matter decays and leaves the prisms ununited, and easily separable from one another. It is only in a few families of bivalves that the cellular structure is seen in this very distinct form, or that it makes up a large portion of the shell; and these families are closely allied to *pinna*. In many shells the external layer is formed on the above plan, while the internal layer is nacreous; in many, again, the nacre, or "mother of pearl," and in others sub-nacreous structure, constitutes nearly the whole thickness of the shell. The nacre, according to sir D. Brewster, consists of a multitude of layers of carbonate of lime, alternating with animal membrane; and the grooved lines on which iridescent luster depends are due to the wearing away of the edges of the animal laminae, while those composed of carbonate of lime stand out; it is, however, more probable, from Dr. Carpenter's researches, that the peculiar lineation of the surface of nacre is due to the disposition of a single membranous layer in folds or plaits, which lie more or less obliquely to the general surface.

In the *crustacea*, the structure of the shell has only been examined in the order of decapods. In this order—in the common crab, for example—the shell consists of three layers, viz., (1) an external horny epidermic membrane covering the exterior; (2) a cellular or pigmentary structure; and (3) an internal calcareous or tubular substance. The horny layer is easily detached after the shell has been for some time immersed in dilute acid; it is thin and tenacious, and presents no trace of structure. The pigmentary layer is very thin in the crab and lobster, but is much thicker in some other decapods. The internal layer is that which constitutes the chief part of the shell; it is in this layer that the calcareous matter is chiefly deposited; but even after this has been removed, a very distinct animal basis remains, which closely resembles that which is left after the dentine of the teeth has been deprived of its inorganic constituents.

For further information on this subject, the reader is referred to Dr. Carpenter's various articles on the microscopic structure of shells, and especially to his article "Shell" in the *Cyclopædia of Anatomy and Physiology* (from which the materials of the present article have been almost entirely drawn), and to his *Microscope and its Revelations*.

SHELLDRAKE, or **SHIELDRAKE**, *Tadorna*, a genus of ducks of the section having the hind-toe without any pendent membrane. The shelldrakes are a connecting link between geese and ducks, having much resemblance to the former. The species are mostly natives of the southern hemisphere, but the COMMON SHELLDRAKE (*T. vulpanser*, or *bellonii*) is common on the sandy sea-shores of Britain; many coming from the n. for the winter, and some remaining all the year, and breeding, making their nests in rabbit-burrows or other holes in soft soil, whence in some places the shelldrake receives the name of *burrow duck*. It is a beautiful bird, the sexes nearly alike in plumage; the head and upper part of the neck green, with a collar of white, and a lower collar of rich chestnut, extending over part of the back, the rest of the back white. The whole length is fully two feet. The shelldrake is very capable of being tamed, and breeds in domestication. Its note is a shrill whistle. Its flesh is coarse and unpalatable.—The RUDDY SHELLDRAKE (*T. rutila*), the only other European species, is rare as a British bird, although common in many parts of Europe and Asia.

SHELLEY, PERCY BYSSHE, the eldest son of sir Timothy Shelley, bart., the representative of an old Sussex family, was born at Field Place, near Horsham, in that county, on Aug. 4, 1792. His earlier education he received at home with his sisters. About the age of ten he was sent to a school near Brentford, and thence, three years after, transferred to Eton. Shy and sensitive, yet self-willed and unsubmitive, he suffered much from the harsh discipline of masters and the tyranny of his ruder associates. In his refusal to fag at Eton he gave early indication of that passionate impatience of every form of constituted authority not approving itself to his reason which continued through life to distinguish him, and to find expression in his writings. In 1808 he left school, and after two years passed at home he was sent to University college, Oxford. Even thus early he had become a free-thinker of a somewhat advanced kind, and a pamphlet, entitled *A Defense of Atheism*, which he circulated during the second year of his college course, led to his expulsion from Oxford. This so irritated his father, that for some time he declined to receive him; and on his rash marriage, in Aug., 1811, to a Miss Harriet Westbrook, the daughter of a retired innkeeper, the estrangement between them became final and complete, the old gentleman consenting to allow his son a liberal yearly income, but never after having any intercourse with him. Shelley's marriage was in its issue tragical. In 1813 a separation took place between him and his wife, who, with two children, returned to the care of her father; and three years after the unhappy

woman drowned herself. The refinements of intellectual sympathy which poets desiderate in their spouses, Shelley failed to find in his wife, but for a time he seems to have lived with her not unhappily; nor to the last had he any fault to allege against her, except such negative ones as might be implied in his meeting a woman he liked better. This was Mary Godwin, daughter of the celebrated William Godwin and Mary Wollstonecraft, with whom, in 1814, he traveled in France and Switzerland, and who afterward became his second wife. Such excuse of his conduct in the matter as the theory of "congenial souls" may afford in the eye of the moralist must to the full be allowed for Shelley, whose later union was of almost ideal felicity and completeness. On the death of his first wife he laid claim to his children; but this their grandfather, Mr. Westbrook, strange as it may now seem, successfully resisted at law on the ground of his atheism, as exhibited in the poem of *Queen Mab*, which a year or two before he had printed, though only for private circulation. In 1815, while living at Bishopsgate, near Windsor, he wrote his *Alastor*, one the most finished and characteristic of his works; which was followed by *The Revolt of Islam*, composed in 1817 at Marlow. During the interval, in the course of a tour in Switzerland, he had formed the acquaintance of lord Byron, with whom afterward in Italy he had much intimate intercourse. In Mar., 1818, he left England finally—as it proved—to proceed to Italy; and during that and the following year, chiefly while a resident in Rome, he produced what may rank as his two finest poems—the grand lyrical drama of *Prometheus Unbound* and the tragedy of *The Cenci*. While at Venice with lord Byron in 1820 he wrote *Julian and Maddalo*, a record in enduring verse of an interesting conversation of the discussional kind between the noble poet and himself. His other works of chief importance are: *Rosalind and Helen*, begun before he left England; *The Witch of the Atlas*, written in 1819; *Ejapychidion*; *Adonais* (a lament on the death of Keats); and *Hellas* (a lyrico-dramatic burst of exultation on the outbreak of the Greek war of liberty)—all three produced in 1821. The winter of 1822 Shelley passed at Pisa; and in the April following he established himself near Lerici, in the gulf of Spezia. His fondness for boating had through life amounted to a passion, and here he indulged it to the full. On July 8, 1823, in the company of an ex-naval friend, Mr. Williams, he sailed from Leghorn, whither he had gone to welcome his friend, Mr. Leigh Hunt, to Italy, and was lost in a sudden squall on his voyage homeward. The bodies were, after some time, washed ashore, and were burned, as the quarantine law of the country required, in presence of lord Byron, Mr. Leigh Hunt, and another intimate friend, Mr. Trelawney. Shelley's ashes were carefully preserved, and lie buried in the Protestant cemetery at Rome, near the grave of Keats.

In Shelley's opinions, religious, social, and political, crude as they often were, and everywhere expressed with an unwise reckless vehemence, there was much that might reasonably offend; and they not only on their own account roused against him a storm of obloquy, but made him throughout life the accredited mark of the most foul and malicious slanders. To this chiefly it is to be attributed that, whilst he lived, his genius met with no wide appreciation; but since, it has been amply recognized, and perhaps no writer of his time at this day ranks higher on the whole than he. In sustained lyrical impetuosity Shelley surpasses every other writer; his diction is not more remarkable for its opulence than for the expressive subtlety and precision with which it defines the nicest refinements of feeling and thought; and his page flashes with imagery like a royal robe rich with gems. But too often, while he dazzles, he also bewilders; he is fond of supersubtle abstractions, unsubstantial as clouds or dreams; and frequently in reading him we seem merely to be looking on wreaths of rainbow-colored mist. This want of clear and firm outlines is more or less felt throughout all his larger works, with the single exception of *The Cenci*, in which a terrible story of real life is dramatized with consummate vigor and directness of treatment. As to the matter of the rest of his poems, they concern themselves, for the most part, not with the world as it is or has been, but with a perfected world which is to be. Shelley is the *vates* of the future, as Scott is the poet of the past. Of the charge of atheism against Shelley it is enough to say that it rests mainly on his boyish poem of *Queen Mab*; that this he did not himself give to the world; and that when, in 1821, it was surreptitiously published, he issued an express protest against his being held answerable for any opinions set forth in it. In his later works a vague pantheism seems indicated; and one or two passages occur which fairly admit of a purely theistic interpretation. Perhaps the most complete edition of Shelley's poems is that by J. Buxton Forman (1880). A selection from his letters, with translations and prose essays, appeared in 1840. A complete edition of his poems, edited by G. E. Woodberry, appeared in 1892. See Medwin's *Life of Shelley* (1849); Trelawney's *Recollections of the Last Days of Shelley and Byron* (Lond. 1858); the *Shelley Memorials* by lady Shelley (1859); *Shelley's Early Life*, by D. MacCarthy (1872); and lives by G. Barnett Smith and J. H. Symonds.

By common testimony of all who knew him, Shelley, who was held up to execration as a perfect monster of iniquity, was one of the purest, gentlest, most lovable of men; of the tenderest private affections, and, beyond the immediate circle of these, of the largest flowing charity. The passion of philanthropy expressed in his writings found as practical an expression in his daily life as if he had never made any very great profession of it. The episode of his first marriage seems more or less awkward for him; but the one passionate frailty of a boy can scarcely be held a serious blemish on a man whose whole subsequent life was exceptional in virtue and beneficence.

MARY WOLLSTONECRAFT GODWIN, wife of the poet, was b. in London, 1797, married Shelley, as above stated, in 1816, and two years later produced a remarkable novel, entitled *Frankenstein*, the hero of which, a profound student of nature, discovers the secret of creating life, and produces a monster whose history, though wild and horrible in its incidents, is invested with a strong human interest. The work had a great success, and may be reckoned the best of Mrs. Shelley's literary efforts. Other novels of hers are *Valperga*; *The Last Man*; *Lodore*; and *The Fortunes of Perkin Warbeck*. She likewise wrote *Rambles in Germany and Italy*; a series of biographies of foreign artists and poets for the *Cabinet Cyclopædia*; and carefully edited her husband's poems. She died in London, Feb. 1, 1851. See *Mary Wollstonecraft*, by Paul (1878).

SHELL-GUNS belong rather to the past than the present, as in modern rifled artillery all guns fire shells. Before their introduction, however, shells were fired from guns of large bore, and proportionately small thickness of metal, not differing materially from howitzers, except that they had greater length.

SHELL-LAC. See LAC.

SHELLS, called in earlier times bombs, consist of hollow vessels of metal, containing gunpowder or other explosive compound, so arranged that it shall explode at a certain point, and spread destruction around by the forcible dispersion of its fragments. The invention of this murderous missile cannot be accurately traced. Shells were employed in 1480 A.D. by the sultan of Gujerat, and by the Turks at the siege of Rhodes, in 1522. The Spaniards and Dutch both used them during the war of Dutch independence; and they appear to have been generally adopted by about 1634. As shells required mortars (q.v.) for their projection, they were not used in naval warfare until the French constructed special bomb-vessels in 1681; but since that period, shell-guns, being cannon of large bore, have been introduced, and shells are now employed by all ships of war.

Until within a few years, every shell was a hollow sphere of cast-iron, varying in thickness from half an in. to 2 in., and in diameter from $5\frac{1}{2}$ in. to 13 inches. The sphere had a fuse-hole (like a bung-hole) an inch across, through which the charge was inserted consisting of pieces of metal and powder to burst the shell. The hole was plugged by a fuse, which was a tube of slow-burning powder, timed to communicate fire to the charge after the lapse of a certain number of seconds. This fuse might either be kindled by hand the moment before the mortar was fired, or its ignition might be effected by the act of firing itself. The Shrapnell shell, introduced by col. Shrapnell of the royal artillery, about 1808, contained a number of bullets, and being fired at bodies of men, it was timed to explode about 100 yards before reaching them, when the shell burst, and the bullets with the fragments continued their course, diverging continually as they went, until they reached their object in a death-cloud. The *concussion shell*, or *percussion shell*, is one in which the charge is fired by the detonation of a cap on striking an object. If sufficiently delicate to explode on touching a soft object, and at the same time not to be exploded by the resistance of the air to its rapid flight, this form of shell is the most certain in execution.

Since the introduction of rifled ordnance, the shell has become the commonest form of projectile. It has ceased to be spherical, and is usually in the shape of an elongated bolt. Several rival shells at present divide public favor, and compete for adoption into war service. Without noticing the numerous varieties which are in course of trial on the continent and in America, the following are the principal British competitors: The *Armstrong* shell is a pointed bolt of iron (usually percussion), containing an inner "segment shell," made up of 49 segments of cast-iron. Seven of these segments form a circle, or ring, and 7 circles give the necessary length. A coating of lead affords a soft medium for fitting into the grooves of the gun. The shell thus made somewhat resembles a bottle without a neck. The necessary bursting charge having been inserted, the rear-end is plugged with lead, the fuse is screwed into the front, and the shell is ready for action. This projectile has a great and accurate range, and its segments cannot fail, on explosion, to do great damage. The principal drawback has been found in the lead-casing, which is often thrown off in parts soon after the shell leaves the gun, and which thus falls among the foremost ranks of the army using it, sometimes inflicting severe wounds. The *Whitworth* shell is an elongated hexagonal bolt of iron or steel, cast in one piece, and with a bursting charge at the rear end. It explodes on percussion; but the space allowed for the burster is deemed insufficient to produce the full effect which the length and correctness of the weapon's range give cause to expect. The *Lancaster* shell is oval, to fit the bore of the *Lancaster* gun. *Martin's* shell is charged with molten iron, which sets on fire all combustible matter on which it can be thrown. The *Diaphragm* shell, invented by Col. Boxer, R.A., has an iron division or diaphragm to separate the powder in the shell from any balls or slugs, in order that the friction of the latter may not prematurely cause the powder to explode. A six-pounder diaphragm shell contains 30 carbine-balls, an eight-inch shell, 322 musket-balls. The *Palliser* shell, which is now employed in the British service, is chiefly remarkable for the hardness imparted to its fire-point by a process of "chilling" during casting. See illus., NAVY, vol. X.; also illus., CANNON, ETC., vol. III. See ORDNANCE.

SHELL-SAND. Sand consisting in great part of fragments of shells, and often containing a small proportion of organic matter, is a very useful manure, particularly for

clay soils, heavy loams, and newly-reclaimed bogs. It is also advantageously applied to any soil deficient in lime. It neutralizes the organic acids which abound in peat and forms with them compounds which serve as food for plants. Great deposits of shell-sand are found on the coasts of Devonshire and Cornwall, and are of great value in the agriculture of that district. Shell-sand is also found on many other parts of the British coast, and nowhere more abundantly than in the outer Hebrides. The sand of many parts of the coast, however, being mostly silicious, is incapable of the same use. Shell-sand is much used as a manure in some of the maritime districts of France.

SHELLY'S CASE. There is a rule of real-property law known as "the rule in Shelly's case," established in a case decided in 1591, and reported in Coke i. 104. "When the ancestor," says Coke, "by any gift or conveyance taketh an estate of freehold, and in the same gift or conveyance an estate is limited, either mediately or immediately, to his heirs in fee or in tail, *the heirs* are words of limitation and not words of purchase." The rule is interpreted by Preston, *Estates*, vol. i. as follows: When a person takes an estate of freehold (i.e., for life) under an instrument which also contains a limitation by way of remainder, with or without an intermediate estate interposed, to his heirs or the heirs of his body, *as a class of persons*, the limitation to the heirs entitles the ancestor to the whole estate. The rule has been abolished by statute in most of the states.

SHELTER ISLAND, a town in Suffolk co., N. Y., comprising the island of that name between Great Peconic and Gardiner's bays; pop. '90, 921. The island was settled by emigrants from Connecticut in 1652. It is near the e. end of Long Island, is a popular summer resort, and has a union free school and a public library.

SHELTON, FREDERICK WILLIAM, 1814-81; b. Jamaica, L. I. He was graduated at Princeton college, 1834; studied theology; was successively rector of Protestant Episcopal churches in Huntington, L. I., Fishkill, N. Y., and Montpelier, Vt. After 1854 his home was at Carthage, N. Y., and his work was strictly literary. Among his works, which are largely humorous, are *The Trollopiad* (1837); *The Rector of Saint Bardolph's* (1853); *Peeps from a Belfry* (1855).

SHEMAKHA, the former name for what is now known as the government of Baku, occupying the s.e. portion of Transcaucasia. Area, 15,095 sq. m.; pop. '92, 768,536. North of the Kur and around its mouth the surface is level, low, and fruitful, though little of it is under cultivation. Only in the towns and seaports, and in the villages in their vicinity, are agriculture and industry pursued. There is some cattle breeding, and considerable naphtha is produced.

SHEMITIC LANGUAGES are those dialects supposed at one time to have been employed by the tribes and races descended from Shem, the son of Noah. In Hebrew, the name from which the adjective is derived, is spelt *Shem*; but, as in many other cases, the *sh* of the original was transformed by the Septuagint into *s* (see SHIBBOLETH); and hence, through the influence of the modern versions that have in this respect followed the Septuagint, the form *Semitic* is more current among continental writers than *Shemitic*.

The name *Shemitic* is not, of course, scientifically and ethnologically exact, for, in the first place, not all the nations derived in Genesis from Shem spoke an idiom akin to those understood by the term Shemitic (e.g., the Elamites, Lud, etc.), and, on the other hand, Canaan and Cush, whose Shemitic speech is undoubted, are there traced to Ham. Shemitic languages, however, as a "conventional appellation," is still the best of all the general terms hitherto proposed (Arabic; Syro-Arabic, analogous to Indo-Germanic).

The family of Shemitic languages which spread originally over Canaan (Phenicia and Palestine), Assyria, Aram (Syria, Mesopotamia, Babylonia), and Arabia; and at a later period over part of Asia Minor and the Punic northern coast—i.e., from the countries on the Mediterranean to the Tigris, and from the Armenian mountains to the s. coast of Arabia—may broadly be divided into three principal classes: 1. The Aramaic or northern (north-eastern) dialect, comprising chiefly the so-called Chaldee and Syriac; 2. The southern, the chief representative of which is the Arabic, closely allied to whose older (Himyaritic) form is the Ethiopic; 3. The Middle, or principally Hebraic, to which also belong the languages of the other Palestinian inhabitants, those of the Canaanites and Phenicians above all. The difference between the middle and northern branches is less sharply marked than between the middle and the southern or Arabic.

The question which of the known Semitic dialects most resembles the primitive Semitic language is less important than one might at first suppose, since the question is not one of absolute, but only of relative priority. After scholars had given up the notion (which, however, was not the fruit of scientific research) that all Semitic languages, and indeed all the languages in the world, were descendants of Hebrew or of Aramaic, it was long the fashion to maintain that Arabic bore a close resemblance to the primitive Semitic language. But just as it is now recognized with ever-increasing clearness that Sanskrit is far from having retained, in such a degree as was even lately supposed, the characteristics of primitive Indo-European speech, so in the domain of the Semitic tongues we can assign to Arabic only a relative antiquity. It is true that in Arabic very many features are preserved more faithfully than in the cognate languages; for instance, nearly all the original abundance of consonants, the short vowels in open syllables, particularly in the interior of words, and many grammatical distinctions

which in the other languages are more or less obscured. But, on the other hand, Arabic has coined, simply from analogy, a great number of forms which, owing to their extreme simplicity, seem at the first glance to be primitive forms, but which nevertheless are only modifications of the primitive forms; while, perhaps, the other Semitic languages exhibit modifications of a different kind. In spite of its great wealth, Arabic is characterized by a certain monotony, which can scarcely have existed from the beginning. Both Hebrew and Aramaic are in many respects more ancient than Arabic. This would, no doubt, be far more apparent if we knew Hebrew more completely and according to the original pronunciation of its vowels, and if we could discover how Aramaic was pronounced about the 13th century before our era. It must always be borne in mind that we are far more fully and accurately acquainted with Arabic than with the other Semitic languages of antiquity. The opinion sometimes maintained by certain over-zealous Assyriologists, that Assyrian is the "Sanskrit of the Semitic world," has not met with the approval even of the Assyriologists themselves, and is unworthy of a serious refutation. A comparative grammar of the Semitic languages must, of course, be based upon Arabic, but must in every matter of detail take into consideration all the cognate languages, as far as they are known to us. In the reconstruction of the primitive Semitic tongue Hebrew might, perhaps, afford more assistance than Ethiopic; but Aramaic, Assyrian, and even the less known and the more modern dialects might furnish valuable materials.

Many attempts have been made, sometimes in a very superficial fashion and sometimes by the use of scientific methods, to establish a relationship between the Semitic languages and the Indo-European. It was very natural to suppose that the tongues of the two races which, with the single exceptions of the Egyptians and the Chinese, have formed and moulded human civilization, who have been near neighbors from the earliest times, and who, moreover, seem to bear a great physical resemblance to one another, can be nothing else than two descendants of the same parent speech. But all these endeavors have wholly failed. It is indeed probable that the language not only of the Semites and of the Indo-Europeans, but also those of other races are derived from the same stock, but the separation must have taken place at so remote a period, that the changes which these languages underwent in prehistoric times have completely effaced what features they possessed in common; if such features have sometimes been preserved, they are no longer recognizable. It must be remembered that it is only in exceptionally favorable circumstances that cognate languages are so preserved during long periods as to render it impossible for scientific analysis to prove their relationship with one another.

On the other hand, the Semitic languages bear so striking a resemblance in some respects to certain languages of northern Africa, that we are forced to assume the existence of a tolerably close relationship between the two groups. We allude to the family of languages known in modern times as the "Hamitic," and composed of the Egyptian, Berber, Beja (Bishâri, etc.), and a number of tongues spoken in Abyssinia and the neighboring countries (Agaw, Galla, Dankali, etc.). It is remarkable that some of the most indispensable words in the Semitic vocabulary (as, for instance, "water," "mouth," and certain numerals) are found in Hamitic also, and that these words happen to be such as cannot well be derived from triliteral Semitic roots, and are more or less independent of the ordinary grammatical rules. We notice, too, important resemblances in grammar—for example, the formation of the feminine by means of a *t* prefixed or affixed, that of the causative by means of *s*, similarity in the suffixes and prefixes of the verbal tenses, and, generally, similarity in the personal pronouns, etc. It must be admitted that there is also much disagreement—for instance, the widest divergence in the mass of the vocabulary; and this applies to the Semitic languages as compared not only with those Hamitic languages that are gradually becoming known to us at the present day, but with the Egyptian, of which we possess documents dating from the fourth millennium before the Christian era. The question is here involved in great difficulties. Some isolated resemblances may, improbable as it appears, have been produced by the borrowing of words. Uncivilized races, as has been proved with certainty, sometimes borrow from others elements of speech in cases where we should deem such a thing impossible—for example, numerals and even personal suffixes. But the great resemblances in grammatical formation cannot be reasonably explained as due to borrowing on the part of the Hamites, more especially as these points of agreement are also found in the language of the Berbers, who are scattered over an enormous territory, and whose speech must have acquired its character long before they came into contact with the Semites. We are even now but imperfectly acquainted with the Hamitic languages; it is not yet certain into what groups they fall; and the relation in which Egyptian stands to Berber on the one hand, and to the south Hamitic languages on the other, requires further elucidation. The attempt to write a comparative grammar of the Semitic and Hamitic languages would be, to say the least, very premature.

The connection between the Semitic languages and the Hamitic appears to indicate that the primitive seat of the Semites is to be sought in Africa; for it can scarcely be supposed that the Hamites, among whom there are gradual transitions from an almost purely European type to that of the Negroes, are the children of any other land than "the dark continent." There seems, moreover, to be a considerable physical resem-

balance between the Hamites and the Semites, especially in the case of the southern Arabs; we need mention only the slight development of the calf of the leg, and the sporadic appearance among Semites of woolly hair and prominent jaws. But both Semites and Hamites have been mingled to a large extent with foreign races, which process must have diminished their mutual similarity. All this, however, is offered not as a definite theory, but as a modest hypothesis.

It is not very easy to settle what is the precise connection between the various Semitic languages, considered individually. In this matter one may easily be led to hasty conclusions by isolated peculiarities in vocabulary or grammar. Each of the older Semitic languages occasionally agrees in grammatical points with some other, to which in most respects it bears no very close resemblance, while dialects much more closely related to it are found to exhibit different formations. Each Semitic tongue also possesses features peculiar to itself. For instance, the Hebrew-Phœnician group and the Arabic have a prefixed definite article (the etymological identity of which is, however, not quite certain); the dialect nearest to Arabic, the Sabæan, expresses the article by means of a suffixed *n*; the Aramaic, which in general more closely resembles Hebrew than does the Arabic group, expresses it by means of a suffixed *ā*; whereas the Assyrian in the north and the Ethiopic in the south have no article at all. Of this termination *n* for the definite article there is no trace in either Arabic or Hebrew; the Sabæan, the Ethiopic, and the Aramaic employ it to give emphasis to demonstrative pronouns; and the very same usage has been detected in a single Phœnician inscription. In this case, therefore, Hebrew and Arabic have, independently of one another, lost something which the languages most nearly related to them have preserved. In like manner, the strengthening of the pronoun of the third person by means of *t* (or *tū*) is only found in Ethiopic, Sabæan, and Phœnician. Aramaic alone has no certain trace of the reflexive conjugation formed with prefixed *n*; Hebrew alone has no certain trace of the causative with *sha*. In several of the Semitic languages we can see how the formation of the passive by means of internal vocal change (as *kullima*, "he was addressed," as distinguished from *kallama*, "he addressed") gradually dropped out of use; in Ethiopic this process was already complete when the language first became literary; but in Aramaic it was not wholly so. In a few cases phonetic resemblances have been the result of later growth. For example, the termination of the plural masculine of nouns is in Hebrew *īm*, in Aramaic *in*, as in Arabic. But we know that Aramaic also originally had *m*, whereas the ancient Arabic forms have after the *n* an *a*, which appears to have been originally a long *ā* (*īna*, *ina*); in this latter position (that is, between two vowels) the change of *m* into *n* is very improbable. These two similar terminations were, therefore, originally distinct. We must indeed be very cautious in drawing conclusions from points of agreement between the vocabularies of the various Semitic tongues. The Ethiopians and the Hebrews have the same word for many objects which the other Semites call by other names—for instance, "stone," "tree," "enemy," "enter," "go out;" and the same may be said of Hebrew as compared with Sabæan. But to build theories upon such facts would be unsafe, since the words cited are either found, though with some change of meaning, in at least one of the cognate languages, or actually occur, perhaps quite exceptionally and in archaic writings, with the same signification. The sedentary habits of the Ethiopians and the Sabæans may possibly have rendered it easier for them to retain in their vocabulary certain words which were used by the civilized Semites of the north, but which became obsolete among the Arabian nomads. To the same cause we may attribute the fact that in religion the Sabæans resemble the northern Semites more closely than do the tribes of central Arabia; but these considerations prove nothing in favor of a nearer linguistic affinity.

One thing at least is certain, that Arabic (with Sabæan) and Ethiopic stand in a comparatively close relationship to one another, and compose a group by themselves, as contrasted with the other Semitic languages, Hebrew-Phœnician, Aramaic, and Assyrian, which constitute the northern group. Only in these southern dialects do we find, and that under forms substantially identical, the important innovation known as the "broken plurals." They agree, moreover, in employing a peculiar development of the verbal root, formed by inserting an *ā* between the first and second radicals (*kātala*, *takātala*), in using the vowel *a* before the third radical in all active perfects—for example (*h*)*aktala kattala*, instead of the *haktil*, *kattil* of the northern dialects—and in many other grammatical phenomena. This is not at all contradicted by the fact that certain aspirated dentals of Arabic (*th*, *dh*, *ṭh*) are replaced in Ethiopic, as in Hebrew and Assyrian, by pure sibilants—that is, *s* (Hebrew and Assyrian *sh*), *z*, *ṣ*—whereas in Aramaic they are replaced by simple dentals (*t*, *d*, *ṭ*), which seem to come closer to the Arabic sounds. After the separation of the northern and the southern groups, the Semitic languages possessed all these sounds, as the Arabic does, but afterwards simplified them, for the most part, in one direction or the other. Hence there resulted, as it were by chance, occasional similarities. Even in modern Arabic dialects *th*, *dh* have become sometimes *t*, *d*, and sometimes *s*, *z*. Ethiopic, moreover, has kept *d*, the most peculiar of Arabic sounds, distinct from *c*, whereas Aramaic has confounded it with the guttural 'ain, and Hebrew and Assyrian with *c*. It is therefore evident that all these languages once possessed the consonant in question as a

distinct one. One sound, *śn*, appears only in Hebrew, in Phœnician, and in the older Aramaic. It must originally have been pronounced very like *sh*, since it is represented in writing by the same character; in later times it was changed into an ordinary *s*. Assyrian does not distinguish it from *sh*. The division of the Semitic languages into the northern group and the southern is therefore justified by facts. Even if we were to discover really important grammatical phenomena in which one of the southern dialects agreed with the northern, or *vice versâ*, and that in cases where such phenomena could not be regarded either as remnants of primitive Semitic usage, or as instances of parallel but independent development, we ought to remember that the division of the two groups was not necessarily a sudden and instantaneous occurrence, that even after the separation intercourse may have been carried on between the various tribes who spoke kindred dialects and were therefore still able to understand one another, and that intermediate dialects may once have existed, perhaps such as were in use amongst tribes who came into contact sometimes with the agricultural population of the north and sometimes with the nomads of the south (see below). All this is purely hypothetical, whereas the division between the northern and the southern Semitic languages is a recognized fact.

HEBREW.—Hebrew and Phœnician are but dialects of one and the same language. It is only as the language of the people of Israel that Hebrew can be known with any precision. Since in the Old Testament a few of the neighboring peoples are represented as being descended from Eber, the eponym of the Hebrews—that is, are regarded as nearly related to the latter, it was natural to suppose that they likewise spoke Hebrew—a supposition which, at least in the case of the Moabites, has been fully confirmed by the discovery of the Mesha inscription (date soon after 900 B.C.). The language of this inscription scarcely differs from that of the Old Testament; the only important distinction is the occurrence of a reflexive form (with *t* after the first radical), which appears nowhere else but in Arabic. We may remark in passing that the style of this inscription is quite that of the Old Testament, and enables us to maintain with certainty that a similar historical literature existed among the Moabites. But it must be remembered that ancient Semitic inscriptions exhibit, in a sense, nothing but the skeleton of the language, since they do not express the vowels at all, or do so only in certain cases; still less do they indicate other phonetic modifications, such as the doubling of consonants, etc. It is therefore very possible that *to the ear* the language of Moab seemed to differ considerably from that of the Judeans.

The Mesha inscription is the only non-Israelite source from which any knowledge of ancient Hebrew can be obtained. (See *Jews—Language and Literature*.) Some fragments in the Old Testament belong to the second millennium before our era, particularly the song of Deborah (Judges v.), a document which, in spite of its many obscurities in matters of detail, throws much light on the condition of the Israelites at the time when the Canaanites were still contending with them for the possession of the country. The first rise of an historical literature may very probably date from before the establishment of the monarchy. Various portions of the Old Testament belong to the time of the earlier kings; but it was under the later kings that a great part of extant Hebrew literature came into shape. To this age belong also the Siloam inscription and a few seals and gems bearing the names of Israelites. The Hebrew language is thus known to us from a very ancient period. But we are far from being acquainted with its real phonetic condition in the time of David or Isaiah. For, much as we owe to the labors of the later Jewish schools, which with infinite care fixed the pronunciation of the sacred text by adding vowels and other signs, it is evident that even at the best they could only represent the pronunciation of the language in its latest stage, not that of very early ages. Besides, their object was not to exhibit Hebrew simply as it was, but to show how it should be read in the solemn chant of the synagogue. Accordingly the pronunciation of the older period may have differed considerably from that represented by the punctuation. Such differences are now and then indicated by the customary spelling of the ancient texts, and sometimes the orthography is directly at variance with the punctuation. In a few rare cases we may derive help from the somewhat older tradition contained in the representation of Hebrew words and proper names by Greek letters, especially in the ancient Alexandrine translation of the Bible (the so-called Septuagint). It is of particular importance to remark that this older tradition still retains an original *α* in many cases where the punctuation has the later *i* or *e*. We have examined this point somewhat in detail, in order to contradict the false, but ever-recurring notion that the ordinary text of the Bible represents without any essential modification the pronunciation of ancient Hebrew, whereas in reality it expresses (in a very instructive and careful manner, it is true) only its latest development, and that for the purpose of solemn public recitation. A clear trace of dialectal differences within Israel is found in Judges xii. 6, which shows that the ancient Ephraimites pronounced *s* instead of *sh*.

The ancient Hebrew language, especially in the matter of syntax, has an essentially primitive character. Parataxis of sentences prevails over hypotaxis to a greater extent than in any other literary Semitic language with which we are well acquainted. The favorite method is to link sentences together by means of a simple "and." There is a great lack of particles to express with clearness the more subtle connection of ideas.

The use of the verbal tenses is in a great measure determined by the imagination, which regards things unaccomplished as accomplished and the past as still present. There are but few words or inflections to indicate slight modifications of meaning, though in ancient times the language may, perhaps, have distinguished certain moods of the verb somewhat more plainly than the present punctuation does. But in any case this language was far less suited for the definite expression of studied thought, and less suited still for the treatment of abstract subjects than for poetry. We must remember, however, that as long as Hebrew was a living language it never had to be used for the expression of the abstract. Had it lived somewhat longer it might very possibly have learned to adapt itself better to the formulating of systematic conceptions. The only book in the Old Testament which attempts to grapple with an abstract subject in plain prose—namely, Ecclesiastes—dates from a time when Hebrew was dying out or was already dead. That the gifted author does not always succeed in giving clear expression to his ideas, is partly due to the fact that the language had never been employed for any scientific purposes whatsoever. With regard to grammatical forms, Hebrew has lost much that is still preserved in Arabic; but the greater richness of Arabic is in part the result of later development.

The vocabulary of the Hebrew language is, as we have said, known but imperfectly. The Old Testament is no very large work; it contains, moreover, many repetitions, and a great number of pieces which are of little use to the lexicographer. On the other hand, much may be derived from certain poetical books, such as Job. The numerous ἀπαξ λεγόμενα are a sufficient proof that many more words existed than appear in the Old Testament, the writers of which never had occasion to use them. Were we in possession of the whole Hebrew vocabulary in the time of Jeremiah, for example, we should be far better able to determine the relation in which Hebrew stands to the other Semitic languages, the Old Testament would be far more intelligible to us, and it would be very much easier to detect the numerous corrupt passages in our text.

PHœNICIAN.—This dialect closely resembles Hebrew, and is known to us from only one authentic source—namely, inscriptions, some of which date from about 600 B.C. or earlier; but the great mass of them begin with the 4th century before our era. These inscriptions we owe to the Phœnicians of the mother country and the neighboring regions (Cyprus, Egypt, and Greece), as well as to the Phœnicians of Africa, especially Carthage. Inscriptions are, however, a very insufficient means for obtaining the knowledge of a language. The number of subjects treated in them is not large; many of the most important grammatical forms, and many of the words most used in ordinary life, do not occur. Moreover, the “lapidary style” is often very hard to understand. The repetition of obscure phrases, in the same connection, in several inscriptions, does not help to make them more intelligible. Of what use is it to us that, for instance, thousands of Carthaginian inscriptions begin with the very same incomprehensible dedication to two divinities? The difficulty of interpretation is greatly increased by the fact that single words are very seldom separated from one another, and that vowel-letters are used extremely sparingly. We therefore come but too often upon very ambiguous groups of letters. In spite of this, our knowledge of Phœnician has made considerable progress of late. Some assistance is also got from Greek and Latin writers, who cite not only many Phœnician proper names, but single Phœnician words: Plautus, in particular, inserts in the *Pœnulus* whole passages in Punic, some of which are accompanied by a Latin translation. This source of information must, however, be used with great caution. It was not the object of Plautus to exhibit the Punic language with precision, a task for which the Latin alphabet is but ill adapted, but only to make the populace laugh at the jargon of the hated Carthaginians. Moreover, he had to force the Punic words into Latin *senarii*; and finally the text, being unintelligible to copyists, is terribly corrupt. Much ingenuity has been wasted on the Punic of Plautus, but the passage yields valuable results to cautious investigation which does not try to explain too much. In its grammar Phœnician closely resembles Hebrew. In both dialects the consonants are the same, often in contrast to Aramaic and other cognate languages. As to vowels, Phœnician seems to diverge rather more from Hebrew. The connecting of clauses is scarcely carried further in the former language than in the latter. A slight attempt to define the tenses more sharply appears once, at least, in the joining of *kân* (fruit) with a perfect, to express complete accomplishment (or the pluperfect). One important difference is, that the use of *vâw* conversive with the imperfect—so common in Hebrew and in the inscription of Mesha—is wanting in Phœnician. The vocabulary of the language is very like that of Hebrew, but words rare in Hebrew are often common in Phœnician. For instance, “to do” is in Phœnician not *‘asâ* but *pa‘al* (the Arabic *fâ‘ala*), which in Hebrew occurs only in poetry and elevated language. “Gold” is not *zahab* (as in most Semitic languages), but *harûc* (Assyrian *hurûc*), which is used occasionally in Hebrew poetry. Traces of dialectal distinctions have been found in the great inscription of Byblus, the inhabitants of which seem to be distinguished from the rest of the Phœnicians in Josh. xii. 5 [and 1 Kings v. 32? [A. V. v. 18]]. It is probable that various differences between the language of the mother-country and that of the African colonies arose at an early date, but our materials do not enable us to come to any definite conclusion on this

point. In the later African inscriptions there appear certain phonetic changes, especially in consequence of the softening of the gutturals—changes which show themselves yet more plainly in the so-called Neo-Punic inscriptions (beginning with the 1st, if not the 2nd, century before our era). In these the gutturals, which had lost their real sound, are frequently interchanged in writing, and other modifications may also be perceived. Unfortunately the Neo-Punic inscriptions are written in such a debased, indistinct character that it is often impossible to discover with certainty the real form of the words. This dialect was still spoken about 400, and perhaps long afterwards, in those districts of North Africa which had once belonged to Carthage. It would seem that in the mother-country the Phœnician language withstood the encroachment of Greek on the one hand and of Aramaic on the other somewhat longer than Hebrew did.

ARAMAIC.—Aramaic is nearly related to Hebræo-Phœnician, but there is nevertheless a sharp line of demarcation between the two groups. Of its original home nothing certain is known. In the Old Testament "Aram" appears at an early period as a designation of certain districts in Syria ("Aram of Damascus," etc.) and in Mesopotamia ("Aram of the Two Rivers"). The language of the Arameans gradually spread far and wide, and occupied all Syria, both those regions which were before in the possession of the Kheta, probably a non-Semitic people, and those which were most likely inhabited by Canaanite tribes; last of all, Palestine became Aramaized. Towards the east this language was spoken on the Euphrates, and throughout the district of the Tigris south and west of the Armenian and Kurdish mountains; the province in which the capitals of the Arsacides and the Sassanians were situated was called "the country of the Arameans." In Babylonia and Assyria a large, or perhaps the larger portion of the population were most probably Arameans, even at a very early date, whilst Assyrian was the language of the Government.

The Aramaic portions of the Old Testament show us the form of the language which was in use among the Jews of Palestine. Isolated passages in Ezra perhaps belong to the Persian period, but have certainly been remodeled by a later writer. Yet in Ezra we find a few antique forms which do not occur in Daniel. The Aramaic pieces contained in the Bible have the great advantage of being furnished with vowels and other orthographical signs, though these were not inserted until long after the composition of the books, and are sometimes at variance with the text itself. But since Aramaic was still a living language when the punctuation came into existence, and since the lapse of time was not so very great, the tradition ran less risk of corruption than in the case of Hebrew. Its general correctness is further attested by the innumerable points of resemblance between this language and Syriac, with which we are accurately acquainted. The Aramaic of the Bible exhibits various antique features which afterwards disappeared—for example, the formation of the passive by means of internal vowel-change, and the causative with *ha* instead of with *a*, phenomena which have been falsely explained as Hebraisms. Biblical Aramaic agrees in all essential points with the language used in the numerous inscriptions of Palmyra (beginning soon before the Christian era and extending to about the end of the 3d century) and on the Nabatean coins and stone monuments (concluding about the year 100). Aramaic was the language of Palmyra, the aristocracy of which were to a great extent of Arabian extraction. In the northern portion of the Nabatean kingdom (not far from Damascus) there was probably a large Aramaic population, but farther south Arabic was spoken. At that time, however, Aramaic was highly esteemed as a cultivated language, for which reason the Arabs in question made use of it, as their own language was not reduced to writing, just as in those ages Greek inscriptions were set up in many districts where no one spoke Greek. That the Nabateans were Arabs is sufficiently proved by the fact that, with the exception of a few Greek names, almost all the numerous names which occur in the Nabatean inscriptions are Arabic, in many cases with distinctly Arabic terminations. A further proof of this is that in the great inscriptions over the tombs of Hejr (not far from Teimâ) the native Arabic continually shows through the foreign disguise—for instance, in the use of the Arabic words whenever the writer does not happen to remember the corresponding Aramaic terms, in the use of the Arabic particle *fa*, of the Arabic *ghair*, "other than," and in several syntactic features. The great inscriptions cease with the overthrow of the Nabatean kingdom by Trajan (105); but the Arabian nomads in those countries, especially in the Sinaitic peninsula, often scratched their names on the rocks down to a later period, adding some benedictory formula in Aramaic. The fact that several centuries afterwards the name of "Nabatean" was used by the Arabs as synonymous with "Aramean" was probably due to the gradual spread of Aramaic over a great part of what had once been the country of the Nabateans. In any case Aramaic then exercised an immense influence. This is also proved by the place which it occupies in the strange Pahlavi writing, various branches of which date from the time of the Parthian empire (see PEHLEVÍ). Biblical Aramaic, as also the language of the Palmyrene and Nabatean inscriptions, may be described as an older form of Western Aramaic. The opinion that the Palestinian Jews brought their Aramaic dialect direct from Babylon—whence the incorrect name "Chaldee"—is altogether untenable.

Not only the Jews but also the Christians of Palestine retained their native dialect for some time as an ecclesiastical and literary language. We possess translations of the

Gospels and fragments of other works in this dialect by the Palestinian Christians dating from about the 5th century, accompanied by a punctuation which was not added till some time later. This dialect closely resembles that of the Palestinian Jews, as was to be expected from the fact that those who spoke it were of Jewish origin.

Finally, the Samaritans, among the inhabitants of Palestine, translated their only sacred book, the Pentateuch, into their own dialect. The critical study of this translation proves that the language which lies at its base was very much the same as that of the neighboring Jews. Perhaps, indeed, the Samaritans may have carried the softening of the gutturals a little further than the Jews of Galilee. Their absurd attempt to embellish the language of the translation by arbitrarily introducing forms borrowed from the Hebrew original has given rise to the false notion that Samaritan is a mixture of Hebrew and Aramaic. The introduction of Hebrew and even of Arabic words and forms was practised in Samaria on a still larger scale by copyists who lived after Aramaic had become extinct. The later works written in the Samaritan dialect are, from a linguistic point of view, as worthless as the compositions of Samaritans in Hebrew; the writers who spoke Arabic endeavored to write in languages with which they were but half acquainted.

All these Western Aramaic dialects, including that of the oldest inscriptions, have this feature among others in common, that they form the third person singular masculine and the third person plural masculine and feminine in the imperfect by prefixing *y*, as do the other Semitic languages. And in these dialects the termination *û* (the so-called "status emphaticus") still retained the meaning of a definite article down to a tolerably late period.

As early as the 7th century the conquests of the Moslems greatly circumscribed the domain of Aramaic, and a few centuries later it was almost completely supplanted in the west by Arabic. For the Christians of those countries, who, like every one else, spoke Arabic, the Palestinian dialect was no longer of importance, and they adopted as their ecclesiastical language the dialect of the other Aramaean Christians, the Syriac (or Edessene). The only localities where a Western Aramaic dialect still survives are a few villages in Anti-Libanus. Our information upon this subject is but slight and fragmentary; but it is hoped that Professors Prym and Socin will soon be able to furnish more ample details.

At Edessa, in the west of Mesopotamia, the native dialect had already been used for some time as a literary language, and had been reduced to rule through the influence of the schools (as is proved by the fixity of the grammar and orthography), even before Christianity acquired power in the country in the 2nd century. At an early period the Old and New Testaments were here translated with the help of Jewish tradition. This version (the so-called Peshitta or Peshito) became the Bible of Aramaean Christendom, and Edessa became its capital. Thus the Aramaean Christians of the neighboring countries, even those who were subjects of the Persian empire, adopted the Edessan dialect as the language of the church, of literature, and of cultivated intercourse. Since the ancient name of the inhabitants, "Aramæans," just like that of *Ἑλλῆνες*, had acquired in the minds of Jews and Christians the unpleasant signification of "heathens," it was generally avoided, and in its place the Greek terms "Syrians" and "Syriac" were used. But "Syriac" was also the name given by the Jews and Christians of Palestine to their own language, and both Greeks and Persians designated the Aramaeans of Babylonia as "Syrians." It is, therefore, properly speaking, incorrect to employ the word "Syriac" as meaning the language of Edessa alone; but since it was the most important of these dialects, it has the best claim to this generally received appellation. It has, as we have said, a shape very definitely fixed; and in it the above-mentioned forms of the imperfect take an *n*. As in the Babylonian dialects, the termination *û* has become so completely a part of the substantive, to which it is added, that it has wholly lost the meaning of the definite article, whereby the clearness of the language is perceptibly impaired. The influence exercised by Greek is very apparent in Syriac. From the 3d to the 7th century an extensive literature was produced in this language, consisting chiefly, but not entirely, of ecclesiastical works. In the development of this literature the Syrians of the Persian empire took an eager part. In the Eastern Roman empire Syriac was, after Greek, by far the most important language; and under the Persian kings it virtually occupied a more prominent position as an organ of culture than the Persian language itself. The conquests of the Arabs totally changed this state of things. But meanwhile, even in Edessa, a considerable difference had arisen between the written language and the popular speech, in which the process of modification was still going on. About the year 700 it became a matter of absolute necessity to systematize the grammar of the language and to introduce some means of clearly expressing the vowels. The principal object aimed at was that the text of the Syriac Bible should be recited in a correct manner. But, as it happened, the eastern pronunciation differed in many respects from that of the west. The local dialects had to some extent exercised an influence over the pronunciation of the literary tongue; and, on the other hand, the political separation between Rome and Persia, and yet more the ecclesiastical schism—since the Syrians of the east were mostly Nestorians, those of the west Monophysites and Catholics—had produced divergencies between the traditions of the various schools. Starting, therefore, from a common source, two distinct systems of

punctuation were formed, of which the western is the more convenient, but the eastern the more exact and generally the more in accordance with the ancient pronunciation; it has, for example, *ḏ* in place of the western *ḍ*, and *ḥ* in many cases where the western Syrians pronounce *ḥ*. In later times the two systems have been intermingled in various ways.

Arabic everywhere put a speedy end to the predominance of Aramaic—a predominance which had lasted for more than a thousand years—and soon began to drive Syriac out of use. At the beginning of the 11th century the learned metropolitan of Nisibis, Elias bar Shinnáyá, wrote his books, intended for Christians, either entirely in Arabic or in Arabic and Syriac arranged in parallel columns—that is, in the spoken and in the learned language. Thus, too, it became necessary to have Syriac-Arabic glossaries. Up to the present day Syriac has remained in use for literary and ecclesiastical purposes, and may perhaps be even spoken in some monasteries and schools, but it has long been a dead language. When Syriac became extinct in Edessa and its neighborhood is not known with certainty.

This language, called Syriac *par excellence*, is not the immediate source whence are derived the Aramaic dialects still surviving in the northern districts. In the mountains known as the Túr 'Abdin in Mesopotamia, in certain districts east and north of Mosul, in the neighboring mountains of Kurdistan, and again beyond them on the western coast of Lake Urmia, Aramaic dialects are spoken by Christians and occasionally by Jews, and some of these dialects we know with tolerable precision. The dialect of Túr 'Abdin seems to differ considerably from all the rest; the country beyond the Tigris is, however, divided, as regards language, amongst a multitude of local dialects. Amongst these, that of Urmia has become the most important, since American missionaries have formed a new literary language out of it. Moreover, the Roman Propaganda has printed books in two of the Neo-Syriac dialects. All these dialects exhibit a complete transformation of the ancient type, to a degree incomparably greater than is the case, for example, with Mandaean. In particular, the ancient verbal tenses have almost entirely disappeared, but have been successfully replaced by new forms derived from participles. There are also other praiseworthy innovations. The dialect of Túr 'Abdin has, for instance, again coined a definite article. By means of violent contractions and phonetic changes some of these dialects, particularly that of Urmia, have acquired a euphony scarcely known in any other of the Semitic languages, with their *stridentia anhelantiaque verba* (Jerome). These Aramæans have all adopted a motley crowd of foreign words, from the Arabs, Kurds, and Turks, on whose borders they live and of whose languages they can often speak at least one.

ARABIC.—The southern group of Semitic languages consists of Arabic and Ethiopic. Arabic, again, is subdivided into the dialects of the larger portion of Arabia and those of the extreme south (the Sabæan, etc.). At a very much earlier time than we were but lately justified in supposing, some of the northern Arabs reduced their language to writing; for travelers have quite recently discovered in the northern parts of the Hijáz inscriptions in a strange character, which seem to have been written long before our era. The character resembles the Sabæan, but perhaps represents an earlier stage of graphical development. These inscriptions have been called "Thamudic," because they were found in the country of the Thamúd; but this designation is scarcely a suitable one, because during the period when the power of the Thamúd was at its height, and when the buildings mentioned in the Koran were hewn in the rocks, the language of this country was Nabatæan (see above). Unfortunately the inscriptions hitherto discovered are all short, and for the most part fragmentary, and consequently furnish but little material to the student of languages. But there can be no doubt that they are written in an Arabic dialect. The treatment of the dentals, amongst other things, is a sufficient proof of this. At least in one point they bear a striking resemblance to Hebrew; they have the article *ha* (not *hal*, as we might expect). It is possible that the tribes living on Arabian soil which are regarded in the Old Testament as nearly related to Israel—that is, the Ismaelites, the Midianites, and even the Edomites, may have spoken dialects occupying a middle position between Arabic and Hebrew. They are perhaps traces of some such intermediate link that have been preserved to us in these inscriptions.

The numerous inscriptions scattered over the northwest of Arabia, especially over the wild and rocky district of Safá, near Damascus, probably date from a later period. They are written in peculiar characters, which, it would seem, are likewise related to those used by the Sabæans. They are all of them short and indistinct, scratched hurriedly and irregularly upon unhewn stone. What we at present understand of them—they consist almost entirely of proper names—is owing in nearly every case to the ingenuity of Halévy. In matters of detail, however, much still remains uncertain. To decipher them with absolute certainty will no doubt always be impossible on account of their careless execution. These inscriptions are probably the work of Arab emigrants from the south.

During the whole period of the preponderance of Aramaic this language exercised a great influence upon the vocabulary of the Arabs. The more carefully we investigate the more clearly does it appear that numerous Arabic words, used for ideas or objects which presuppose a certain degree of civilization, are borrowed from

the Aramæans. Hence the civilizing influence of their northern neighbors must have been very strongly felt by the Arabs, and contributed in no small measure to prepare them for playing so important a part in the history of the world.

The Koran and Islam raised Arabic to the position of one of the principal languages of the world. Under the leadership of the Koraish the Bedouins subjected half the world to both their dominion and their faith. Thus Arabic acquired the additional character of a sacred language. But soon it became evident that not nearly all the Arabs spoke a language precisely identical with the classical Arabic of the poets. The north-western Arabs played a particularly important part during the period of the Omayyads. The ordinary speech of Mecca and Medina was, as we have seen, no longer quite so primitive as that of the desert. To this may be added that the military expeditions brought those Arabs who spoke the classical language into contact with tribes from out-of-the-way districts, such as 'Omán, Bahrain (Bahrein), and particularly the north of Yemen. The fact that numbers of foreigners, on passing over to Islam, became rapidly Arabized was also little calculated to preserve the unity of the language. Finally, the violent internal and external commotions which were produced by the great events of that time, and stirred the whole nation, probably accelerated linguistic change. In any case, we know from good tradition that even in the 1st century of the Flight the distinction between correct and incorrect speech was quite perceptible.

About the end of the 2d century the system of Arabic grammar was constructed, and never underwent any essential modification in later times. The theory as to how one should express one's self was now definitely fixed. The majority of those Arabs who lived beyond the limits of Arabia already diverged far from this standard; and in particular the final vowels which serve to indicate cases and moods were no longer pronounced. This change, by which Arabic lost one of its principal advantages, was no doubt hastened by the fact that even in the classical style such terminations were omitted whenever the word stood at the end of a sentence (in pause); and in the living language of the Arabs this dividing of sentences is very frequent. Hence people were already quite accustomed to forms without grammatical terminations.

ETHIOPIC.—In Abyssinia, too, and in the neighboring countries, we find languages which bear a certain resemblance to Arabic. The Geez or Ethiopic proper, the language of the ancient kingdom of Aksúm, was reduced to writing at an early date. To judge by the few passages communicated by Salt, the back of the inscription of Aízanás, king of Aksúm about 350, exhibits writing in the Sabæan language, which appears to prove that the development of the Geez character out of the Sabæan, and the elevation of Geez to the rank of a literary language, must have taken place after the year 350. The oldest monuments of this language which are known with certainty are the two great inscriptions of Tázéná, a heathen king of Aksúm dating from about 500. Hitherto our acquaintance with these inscriptions has been derived from very imperfect drawings; but they amply suffice to show that we have here the same language as that in which the Ethiopic Bible is written, with the very same exact indication of the vowels—a point in which Ethiopic has an advantage over all other Semitic characters. Who introduced this vocalization is unknown. When the above-mentioned inscriptions were made the Bible had probably been already translated into Geez from the Greek, perhaps in part by Jews; for Jews and Christians were at that time actively competing with one another, both in Arabia and in Abyssinia; nor were the former unsuccessful in making proselytes. The missionaries who gave the Bible to the Abyssinians must, at least in some cases, have spoken Aramaic as their mother-tongue, for this alone can explain the fact that in the Ethiopic Bible certain religious conceptions are expressed by Aramaic words. During the following centuries various works were produced by the Abyssinians in this language; they were all, so far as we are able to judge, of a more or less theological character, almost invariably translations from the Greek. We cannot say with certainty when Geez ceased to be the language of the people, but it was probably about a thousand years ago. From the time when the Abyssinian kingdom was reconstituted, towards the end of the 13th century, by the so-called Solomonian dynasty (which was of southern origin), the language of the court and of the Government was Amharic; but Geez remained the ecclesiastical and literary language, and Geez literature even showed a certain activity in numerous translations from those Arabic and Coptic works which were in use amongst the Christians of Egypt; besides these a few original writings were composed—namely, lives of saints, hymns, etc. This literary condition lasted till modern times. The language, which had long become extinct, was by no means invariably written in a pure form; indeed, even in manuscripts of more ancient works we find many linguistic corruptions, which have crept in partly through mere carelessness and ignorance, partly through the influence of the later dialects. On points of detail we are still sometimes left in doubt, as we possess no manuscripts belonging to the older period. This renders it all the more important that the ancient and authentic inscriptions upon the monuments of Aksúm should be accurately published.

GEEZ is more nearly related to Sabæan than to Arabic, though scarcely to such a degree as we might expect. The historical intercourse between the Sabæans and the people of Aksúm does not, however, prove that those who spoke Geez were simply a colony from Sabæa; the language may be descended from an extinct cognate dialect

of south Arabia, or may have arisen from a mingling of several dialects. And this colonization in Africa probably began much sooner than is usually supposed. In certain respects Geez represents a more modern stage of development than Arabic; we may cite as instances the loss of some inflectional terminations and of the ancient passive, the change of the aspirated dentals into sibilants, etc. In the manuscripts, especially those of later date, many letters are confounded—namely, *h*, *h*, and *kh*, *s* and *sh*, *ç* and *d*; this, however, is no doubt due only to the influence of the modern dialects. To this same influence, and indirectly, perhaps, to that of the Hamitic languages, we may ascribe the very hard sound now given to certain letters, *k*, *t*, *ç*, and *d*, in the reading of Geez. The last two are at present pronounced something like *ts* and *ts* (the German *z*). A peculiar advantage possessed by Geez and by all Ethiopic languages, is the sharp distinction between the imperfect and the subjunctive: in the former a vowel is inserted after the first radical—a formation of which there seems to be traces in the dialect of Mahra, and which is also believed to have existed in Assyrian. Geez has no definite article, but is very rich in particles. In the ease with which it joins sentences together and in its freedom as to the order of words, it resembles Aramaic. The vocabulary is but imperfectly known, as the theological literature, which is for the most part very arid, supplies us with comparatively few expressions that do not occur in the Bible, whereas the more modern works borrow their phraseology in part from the spoken dialects, particularly Amharic. With regard to the vocabulary, Geez has much in common with the other Semitic tongues, but at the same time possesses many words peculiar to itself; of these a considerable proportion may be of Hamitic origin. Even some grammatical phenomena seem to indicate Hamitic influence; for instance, the very frequent use of the gerundive, a feature which has become still more prominent in the modern dialects, placed as they are in yet closer contact with the Hamitic. We must not suppose that the ancient inhabitants of Aksum were of pure Semitic blood. The immigration of the Semites from Arabia was in all probability a slow process, and under such circumstances there is every reason to assume that they largely intermingled with the aborigines. This opinion seems to be confirmed by anthropological facts.

Very different is the case with AMHARIC, a language of which the domain extends from the left bank of the Takkazé into regions far to the south. Although by no means the only language spoken in these countries, it always tends to displace those foreign tongues which surround it and with which it is interspersed. We here refer especially to the Agaw dialects. Although Amharic has been driven back by the invasions of the Galla tribes, it has already compensated itself to some extent for this loss, as the Yedju and Wollo Gallas, who penetrated into eastern Abyssinia, have adopted it as their language. With the exception, of course, of Arabic, no Semitic tongue is spoken by so large a number of human beings as Amharic. The very fact that the Agaw languages are being gradually, and, as it were, before our own eyes, absorbed by Amharic, makes it appear probable that this language must be spoken chiefly by people who are not of Semitic race. This supposition is confirmed by a study of the language itself. Amharic has diverged from the ancient Semitic type to a far greater extent than any of the dialects which we have hitherto enumerated. Many of the old formations preserved in Geez are completely modified in Amharic. Of the feminine forms there remain but a few traces; and that is the case also with the ancient plural of the noun. The strangest innovations occur in the personal pronouns. And certainly not more than half the vocabulary can without improbability be made to correspond with that of the other Semitic languages. In this, as also in the grammar, we must leave out of account all that is borrowed from Geez, which, as being the ecclesiastical tongue, exercises a great influence everywhere in Abyssinia. On the other hand, we must make allowance for the fact that in this language the very considerable phonetic modifications often produce a total change of form, so that many words which at first have a thoroughly foreign appearance prove on further examination to be but the regular development of words with which we are already acquainted. But the most striking deviations occur in the syntax. Things which we are accustomed to regard as usual or even universal in the Semitic languages, such as the placing of the verb before the subject, of the governing noun before the genitive, and of the attributive relative clause after its substantive, are here totally reversed. Words which are marked as genitives by the prefixing of the relative particle, and even whole relative clauses, are treated as one word, and are capable of having the objective suffix added to them. It is scarcely going too far to say that a person who has learned no Semitic language would have less difficulty in mastering the Amharic construction than one to whom the Semitic syntax is familiar. What here appears contrary to Semitic analogy is sometimes the rule in Agaw. Hence it is probable that in this case tribes originally Hamitic retained their former modes of thought and expression after they had adopted a Semitic speech, and that they modified their new language accordingly. And it is not certain that the partial Semitization of the southern districts of Abyssinia (which had scarcely any connection with the civilization of Aksum during its best period) was entirely or even principally due to influences from the north. See Ernest Renan's interesting, though not always trustworthy, *Histoire Générale des Langues Sémitiques* and *Comparative Grammar of the Semitic Languages* (1890); also the special articles, AFRICAN LANGUAGES; ARABIAN LANGUAGE AND LITERATURE; ARAMÆA; ARAMAIC; ASSYRIA; BABYLON; ETHIOPIA; JEWS; PHENICIA; SYRIAC.

SHEMITIC NATIONS or **SHEMITES**. The different nations generally comprised under this name, viz., the Assyrians, the Chaldeans or Babylonians, the Syrians, Phenicians, Hebrews, Arabs, and Ethiopians, are all treated specially in the course of this work; it only remains here to add a few observations on the characteristics ascribed to them all in common, and on the influence they have exercised upon the history and development of humanity. As regards the language, the poverty of the inflections, the well-nigh absolute impossibility of expressing abstract ideas, the general absence of compound verbs and substantives, and the primitive state of the syntax in the Shemitic, as contrasted with the wealth and vigor of the Aryan, have been noticed in the previous article. From this arises, as an almost natural consequence, the general inferiority of Shemitic literature to what we emphatically call "classical literature." Certain most important forms of Indo-Germanic poetry, for instance, are completely wanting in the Shemitic, such as the epopee and the drama; although, on the other hand, the peculiar ancient form of Arabic poetry—the *Kasida*—and the grand bursts of pathos found in the religious books of the Hebrews are vainly sought in Indo-European literature. Again, a primitive state of law seems to have developed among the Aryan nations, the chief characteristic of which was a recognition, albeit a dim enough one, of individual rights, in as far as they did not war against the complex unity of the "state." With the Shemites, in the absence of that talent for organization and conciliation which is so essential a mark of the Indo-Europeans, we find either a patriarchal, an anarchical, or a despotical kind of government. Science and philosophy, in the larger sense of the word, are the almost exclusive property of the Aryans. The inferiority of the Shemites in these respects, however, is amply counterbalanced by the sublime place they take as the ethical teachers of all humanity. How the hard and narrow egotism which, not quite unjustly, is ascribed to them ever came to bear and ripen those grand moral maxims with which we meet in the earliest Jewish records, and which, wrought up to their purest idealism, form the shining glory of the New Testament, is a problem of which some seek the solution in a peculiar *intensity* of character inherent in the Shemitic races; while others account for it by direct "inspiration." The same may be said of that monotheism which belonged, in the first instance, to the Hebrews out of all the nations of the earth. It is a grave mistake, however, to describe, as Renan does, the Shemites indiscriminately as monotheists. Babylon or Assyria, and Syria or Phenicia, and the ante-Islamic Arabs, were neither more nor less polytheistic than the early or present inhabitants of India. And, we may well add, not before the return from the Babylonian exile are the Jews themselves, as a body, to be considered as real monotheists. But ever since, both they, and, from the time of Mohammed, the Arabs, have been the representatives of a more austere and exclusive dogma of the unity of the godhead than a great part of the civilized world has found good to accept up to this day.

SHEMITIC PLURAL. The Shemitic languages, particularly the Hebrew, often use the plural where other languages only make use of the singular. This is particularly the case in terms of space and time—their vastness being conceived, so to say, as a multiplicity. Thus certain regions, like heaven—which, through the influence of the Bible language, is also with us sometimes used *pluraliter*—the expanse of water; further, the place at a person's head or feet, or even certain limbs of the body (conceived as space), like neck, face, etc.; or, again, periods of times, like youth, age, life, and special *lasting* qualities or states, like barrenness, blindness, mercifulness, and the like, are put in plural number, where we have the singular only. It is further applied to might and strength, as consisting originally of a multiplicity of elements of power. This is particularly shown in the word *Elohim* (q.v.),=a unity of many "mights"—i.e., the Supreme Being. The false conclusions as to the plurality of the Divine Persons being proved by this word are best refuted by the occurrence of the plural in the word *Mastar* (Adon), Lord (Baal), when these stand unmistakably for a single human individual.

SHENANDO'AH, a river of Virginia, the largest tributary to the Potomac, drains the beautiful and fertile valley between the Blue ridge and the principal range of the Alleghanies. It rises in two branches near the center of the state, and runs n.e. to the Potomac, 170 m., being navigable for small boats 100 miles. In the war of 1861-65 this valley was the scene of numerous conflicts, was successively occupied by the opposing armies, and finally laid waste by Gen. Sheridan in the autumn of 1864.

SHENANDO'AH, a borough in Schuylkill co., Pa.; on the Lehigh Valley, the Pennsylvania and the Philadelphia and Reading railroads; 13 miles n. of Pottsville, the co. seat. It contains several of the largest coal mines in the anthracite region and many others in the vicinity, and has about 20 churches, electric light and electric street and suburban railroads, high school and public school libraries, national banks, building and loan associations, daily and weekly newspapers, and several manufactories. Pop. '90, 15,944.

SHENSTONE, WILLIAM, the son of Thomas Shenstone of the Leasowes, Hales Owen, Shropshire, and his wife, Anne Penn, was born there in the year 1714. In 1732 he was sent to Pembroke College, Oxford. While there he devoted himself much to the study of English poetry, and in 1737 he published without his name a small volume of miscellaneous verse. Subsequently, for some years, he lived in a somewhat vagrant way, yet without ceasing to cultivate his talent. In 1741 appeared his *Judgment of Hercules*; and next year *The Schoolmistress*, the work by which chiefly he continues to be remembered. In 1745, his parents being dead, he established himself on his property of the

Leasowes, where he thenceforth continued to reside. He busied himself with landscape gardening, and such was his success in beautifying his little estate, that it attracted visitors from all quarters, and brought him more fame than his poetry. He was thus, however, led into serious pecuniary embarrassments, from which, on Feb. 11, 1763, a putrid fever relieved him.

The Schoolmistress, which has secured for its author a permanent if humble place among English poets, is written in the stanza and antique manner of Spenser's *Faery Queen*; and in the contrast between the stateliness of the vehicle, and the familiar and homely quality of the subject, with the graphic truth of its treatment, there is a singular source of charm. The other works of Shenstone are for the most part quite insignificant; but his *Pastoral Ballad* has touches of exquisite tenderness and truth of sentiment expressed in a simple and appropriate melody.

SHEOL (LXX. *Hades, Thanatos, Vulg. Inferi*), a Hebrew term of very frequent occurrence (65 times) in the Old Testament, and rendered by the authorized version: grave, hell, or pit. Its derivation is doubtful: while some connect it with a root, denoting to seek, others derive it from a root, "to dig out," "to hollow" (compare Germ. *Hölle*). The use of the word in the original would seem to prove a great fluctuation of the dogma respecting the world to come, during the various periods represented in the special parts of the Bible. Sometimes it does stand unmistakably for "tomb," although our notions of an artificially prepared grave do not originally belong to it; at other times, it is the abode of disembodied spirits, whether good or evil. It is the place where the dead go to be united with their "people," their "ancestors," friends, and all the departed. It was placed in the center of the earth, or below the ocean, and was a dismal dark place, like the Orcus, or Tartarus. It has gates and bars, it has chambers, valleys, and rivers, and its inhabitants—the shadows—(*rephaim*=feeble ones), who ordinarily enjoy deep repose in this "reign of silence," are troubled by being called up to the surface, or tremble at the arrival of some great tyrant. As the receptacle of all things, it contains the shadows even of trees and kingdoms. It is described as all-devouring, remorseless, and insatiable. There can be no doubt of the existence of an idea—however vague—if not of immortality, in the modern sense, yet of some state after life among the Hebrews, even in the earliest times. For the Gehenna (Ge-Hinom) of the New Test., see HELL. The Old Test. Revision (1885), instead of translating *Sheol*, mostly *transfers* it, avoiding all unwarranted dogmatic implication.

SHEPARD, CHARLES UPHAM, LL.D., b. R. I., 1804; graduated at Amherst college, 1824; studied botany and mineralogy at Cambridge, and taught them at Boston; was assistant to Prof. Silliman at Yale two years, and lecturer on natural history, 1830-47; professor of chemistry and natural history, Amherst, 1845-52; in the medical college at Charleston, S. C., 1854-61; professor of natural history again at Amherst from 1861 to the present time. Prof. S. formed at Amherst a remarkably fine collection of minerals and meteorites; and is author of a treatise on mineralogy, a report on the geology of Connecticut, and many scientific papers. He d. 1886.

SHEPARD, THOMAS, 1605-49; b. England; graduated at Emanuel college, Cambridge, 1627; became a preacher and was silenced for non-conformity; arrived at Boston, 1635; aided in establishing Harvard college, 1636, and became pastor of the church in Cambridge as successor of the Rev. Thomas Hooker, after whom he was esteemed the most learned theologian in New England. Among his writings published during his life are: *New England's Lamentation for Old England's Errors*; *The Sound Believer*; and *Theses Sabbaticæ*. He left also numerous MS. works—some of which have been published in England—and an autobiography, first printed at Cambridge, 1832. An edition of his works, in 3 vols., was published in Boston, 1853.

SHEPARD, WILLIAM, 1737-1817; b. Mass.; was capt. under sir Jeffrey Amherst through the French war, and during the revolution took part in 22 engagements; became a farmer at Westfield, Mass.; as brig.gen. of militia defended the arsenal at Springfield in the Shays insurrection, and was afterward maj.gen. of militia; was a member of the executive council 1788-90, and of congress 1797-1803. In his old age he was very poor.

SHEPHERD-KINGS. See HYKSHOS.

SHEPHERD'S DOG, OR SHEEP DOG, the most useful and valuable of all kinds of dog, and universally employed by shepherds throughout Europe, and in the countries colonized from Europe, and also in some parts of Asia, to assist them in the tending of their flocks. Without it the shepherd would be utterly incapable of taking care of the great number of sheep often under his charge; and the expense of keeping the requisite number of shepherds would far more than take away the profits of sheep-farming. That the dog was employed in the tending of sheep in very ancient times we learn from the allusion to the *dogs of the flock* in Job xxx. 1. Buffon imagined the shepherd's dog to be the original of all the domesticated dogs; but was unable to assign any good reason for such an opinion. The shepherd's dog exhibits nearly the same characters in all parts of Europe, although there are slight diversities in different countries, as between that of England and that of Scotland, there known as the *collie*. It is of middling size—differences of size, however, being among the characteristics of different races; of rather slender form, with a pretty sharp muzzle; the ears erect, or, in some races, drooping at the tip; the

hair soft, long, shaggy, and somewhat waved; the tail slightly pendulous, more or less recurved, and very bushy; the feet well protected by hair, so as to be adapted for rough ground. The eye is very bright and intelligent, although the ordinary demeanor of the animal is remarkably calm and quiet. No kind of dog is more intelligent, and perhaps none so docile. Its ready comprehension of the meaning of its master, its prompt obedience to his word or gesture, its evident knowledge of what is requisite to be done, and the services which it performs can never be observed without admiration. A shepherd's dog exhibits the utmost care to prevent sheep from straying off the road along which they are being driven, and sets itself, often of its own accord, to watch any gate or gap in the fence, or goes immediately to bring back stragglers. It is equally useful on the bleak moor or wild mountain, readily going for sheep, and bringing them from a distance. The sheep become perfectly acquainted with it, and evidently regard it as a friend, and not as an enemy, although the appearance of any other dog would alarm them at once. It knows the sheep of the flock it is required to attend, and even in a crowded market adroitly separates them from others with which they have become mingled. Its remembrance of places is obviously very accurate; and a dog which has found great difficulty in conducting sheep through crowded thoroughfares does the same work much better on subsequent occasions. The intelligence of the shepherd's dog has sometimes been proved in a very remarkable way by dishonest masters employing them to steal sheep; the master merely indicating by some sign the sheep which he wished to add to his own flock, and leaving the dog to do it in his absence. See *illus., Horse, Dogs, AND RABBITS, vol. VII.*

The shepherd's dog is often crossed with other kinds of dog, and particularly with the pointer and setter. Dogs are thus obtained which, whilst capable of all the services required by the shepherd, are equally capable of employment in the pursuit of game.

The *drover's dog* is very often a cross between the shepherd's dog and the mastiff, the foxhound, the pointer, or the greyhound. It displays many of the best qualities of the shepherd's dog, and if too frequently very different from it in its cruel treatment of sheep, the fault is originally that of the brutal master.

SHEPHERD'S PURSE, *Capsella*—formerly *Thlaspi*—*Bursa pastoris*, an annual plant of the natural order *cruciferae*, a most abundant weed in gardens and cornfields in America, and remarkable as one of the few plants that are found over almost the whole world, adapting themselves to almost all soils and climates. It is a very variable plant, from 3 in. to 2 ft. in height, with root-leaves more or less pinnatifid, all the leaves more or less toothed, and rough with hairs. The root-leaves spread closely along the ground. The flowers are white and diminutive. The pouch, from which the English name seems to be derived, is laterally compressed, and somewhat heart-shaped. This is a troublesome weed where it abounds.

SHEPLEY, GEORGE FORSTER, 1819-78; b. Maine; graduated at Dartmouth college, 1837; studied law at Harvard university and at Portland, practiced law at Bangor in 1840. He was U. S. district attorney under Pres. Polk, residing in Portland, and filled the office until 1861. In the war of 1861-1865 he was col. 12th Me. vols., afterwards commanded a brigade in Gen. Butler's expedition. He was placed in command of the city of New Orleans and appointed military governor of Louisiana; held a similar position in Richmond after the surrender in 1865; U. S. circuit judge, first circuit, in 1869.

SHEPPARD, ELIZABETH SARA, 1830-62, English author, who at the age of sixteen published under the pen-name of "E. Berger," the novel *Charles Auchester*, pronounced by Benjamin Disraeli the greatest book that would ever be written on music. This was followed by *Counterparts* (1854); *Almost a Heroine*; *Rumour*; two inferior novels entitled *Beatrice Reynolds* and *The Double Coronet*; a series of juvenile stories, and several songs. The characters in her books are people prominent in her day in music, literature, and public life, barely disguised by fictitious names, Seraphael in *Charles Auchester* being easily recognized as Mendelssohn. See articles on this author in volumes ix. and x. of the *Atlantic Monthly*.

SHEPPARD, JACK (1702-24), a noted English robber, originally a carpenter, but began the career of highwayman in 1720. His history has been popularized by a painting by Thornhill, pantomimes, a history of him by De Foe (1724), a novel by Ainsworth in 1839. He was hanged at Tyburn.

SHEPPEY, ISLE OF, a portion of the county of Kent, insulated from the main-land by the Swale, an arm of the estuary of the Medway, is 9 m. long, and $4\frac{1}{2}$ m. broad. In early times its dimensions were much greater, but the sea has encroached upon, and is gradually eating away, the northern shore, which is lined by cliffs of London clay, from 60 to 80 ft. in height. The church of Minster, formerly in the middle of the island, is now on the n. coast. Great numbers of interesting fossils are found imbedded in the London clay, of which the whole island is composed. Almost the whole of the inhabitants are massed in the seaport of Sheerness (q.v.). Area of island 35 sq. m.; pop. '91, 18,607.

SHEPTON MALLET, a market t. of Somersetshire, 5 m. e.s.e. of Wells. It is a town of considerable antiquity, and is mentioned in *Domesday Book* as Sepeton. Its grammar-school, free to twelve boys, was founded in 1627. Worsted stockings, crape, silk, and velvets are manufactured. It contains several large breweries. Pop. '91, 5,500.

SHER'BET, an oriental beverage, much used in Mohammedan countries, where stimulating drinks are forbidden. It consists of the juices of various fruits diluted with water, and sweetened exactly in the way in which lemonade is made in Europe.

SHERBORNE, a market t. of Dorsetshire, on the river Yeo, 17 m. n.n.w. of Dorchester. The King's school, refounded in 1550, is on the site of the old monastic school. The town was a bishop's see from the 8th to the 11th century. There are several glove manufactories and silk-throwing mills. Pop. '91, 5001.

SHERBROOKE, a co. in s. Quebec, consisting of the townships of Ascot and Oxford; 220 sq. m.; pop. '91, 16,088. It is intersected by the Grand Trunk, the Quebec Central, the Canadian Pacific, and the Boston and Maine railroads. It is drained by the river St. Francis, having valuable water-power, and by the Magog and other small lakes and streams in the w. and s., and lake Memphremagog, bordering on the s.e. Co. seat, Sherbrooke.

SHERBROOKE, city and co. seat of Sherbrooke co., Quebec, Canada; at the junction of the St. Francis and Magog rivers, and on the Boston and Maine, the Canadian Pacific, the Quebec central, and the Grand Trunk railroads; 101 m. e. of Montreal. It contains several banks and insurance companies, is the seat of a Roman Catholic bishop, and has saw and grist mills, breweries, cotton and woolen mills, and manufactories of paper, machinery, flannel and worsted goods, iron castings, cigars, corsets, etc. Pop. '91, 10,110.

SHERBURNE, a co. in e. Minnesota, having the Mississippi river for its s. and s.w. boundary; 424 sq. m.; pop. '90, 5908, chiefly of American birth. It is intersected by the Great Northern railroad. Co. seat, Elk River.

SHERE, or **SHER**, ALI, Ameer of Afghanistan, 1825-79; in 1863 succeeded his father, Dost Mohammed, on the throne. His reign was full of great vicissitudes, and at times was hardly more than nominal, until 1869, when the British influence restored him to full power. During the war with the British, in 1878, Shere Ali left his country, and took refuge among the Russians in Turkestan, where he died.

SHERIDAN, a co. in n.w. Kansas, drained by the Saline river in the s., Prairie Dog creek and the North and Solomon river traversing it latitudinally; 900 sq. m.; pop. '90, 3733. Co. seat, Hoxie.

SHERIDAN, a co. in n.w. Nebraska, drained by Niobrara river; pop. '90, 8687. Co. seat, Rushville.

SHERIDAN, PHILIP HENRY, b. Albany, N. Y., Mar. 6, 1831; graduated at West Point in 1853, and, being assigned to the infantry, served on frontier duty in Texas for nearly two years, and in Oregon, 1855-61. At the commencement of the civil war he was appointed quartermaster of the army of s.w. Missouri, and in April, 1862, chief quartermaster of the western department. In May, 1862, he was appointed col. of the second Michigan volunteer cavalry; was commissioned brig.gen. of volunteers, July 1, 1862; and soon afterward was put in command of the 11th division of the army of the Ohio. He commanded a division in the army of the Cumberland, and at the battle of Stone river, Dec. 31, 1862, saved the army from being routed by his stubborn resistance, for which he was made maj.gen. of volunteers. In the march toward Chattanooga in 1863, he was very active; and in the battle of Chickamauga, though swept off the field by the breaking of the lines, he recovered himself and returned with his own command and some other troops to support Gen. Thomas. In March, 1864, he was called to the army of the Potomac by Gen. Grant. He was given command of the cavalry corps, and during May, June, and July, besides protecting the flanks of the army and reconnoitering the enemy's position, was successfully engaged in eighteen different actions. In Aug., 1864, he was placed in command of the army of the Shenandoah; and soon afterward of the middle military division, gaining several successes over Gen. Early, for which he was made a brig.gen. of the U.S. army, and in the following November maj.gen. After completely crushing Early's army, he desolated the whole region along the banks of the James river, effectually cutting off all supplies for the confederate army from the north. He then made a detour around Richmond joined Gen. Grant's army at City Point, whence he started Mar. 25, 1865, to strike the final blow for the overthrow of Gen. Lee's army of northern Virginia. He fought the battle of Dinwiddie Court-House, Mar. 31; and that of Five Forks, which compelled Lee to evacuate Richmond and Petersburg, April 1. He followed these victories by attacking and harassing the confederate troops during their flight, which led to the surrender of Lee at Appomattox Court-House, April 9, 1865. He was appointed to the command of the military division of the s.w., June 3, and of the military division of the Gulf, July 17; of the department of the Gulf, Aug. 15, 1866; of the fifth military district, including Louisiana and Texas, Mar. 11, 1867; and of the department of the Missouri, with headquarters at fort Leavenworth, Sept. 12. He was made lieut.gen., Mar. 4, 1869, and given command of the division of the Missouri, including the departments of Dakota, of the Missouri, of the Platte, and of Texas, with headquarters at Chicago. He visited Europe in 1870-71. During the political disturbances in Louisiana in 1875, Gen. Sheridan was ordered to

New Orleans, and on quiet being restored returned to his command at Chicago. He assumed command of the army, on the retirement of Gen. Sherman, 1883; died at Nonquit, Mass., Aug. 5, 1888. See *Personal Memoirs* (2 vols., N. Y., 1888).

SHERIDAN, RICHARD BRINSLEY BUTLER, son of Thomas Sheridan, a lecturer on oratory and elocution, in his day of some notoriety; was born at Dublin in Sept. 1751, in due course was sent to school there, and afterward removed to Harrow. He gave no promise as a boy of the brilliancy he afterward displayed as a man, being pronounced a hopeless dunce by all his teachers. He does not seem to have been brought up to any regular employment; and after his elopement and marriage in 1773 with a Miss Linley, a public singer of great beauty and accomplishment, his prospects did not seem bright, more especially as he insisted, on a point of pride, that his wife should give up her profession. As the readiest resource he betook himself to literature. The lighter drama was the sphere which attracted him, and in Jan., 1775, his first comedy, *The Rivals*, was produced. Damned on its first appearance, through certain deficiencies in the acting, this piece on its repetition found gradually the favor with the public which its wit and vivacity deserved, and made the reputation of the writer. In the course of the year following Sheridan followed up his success by a farce of no very great merit, entitled *St. Patrick's Day, or the Scheming Lieutenant*, and a second comedy, *The Duenna*, amid the sparkling dialogue of which are interspersed some songs of exquisite merit. He now became in some unexplained manner—for though his pieces were most successful they could scarcely have brought him the necessary funds—part proprietor of the Drury Lane theater; and in 1777 his *School for Scandal* was produced there. This, which is by much his greatest effort, instantly leaped into the popularity it has ever since continued to retain. His other works for the stage were the inimitably clever farce, *The Critic* (1779), and, after a long interval, *The Stranger* and *Pizarro* (1799), both adapted from the German of Kotzebue. During this interval he was deeply engaged in politics. Sheridan's wit and sprightliness coruscated in society as brightly as they did in his comedies; he was an admirable table-companion—over a bottle the best of then living good-fellows. With Fox and his wild set these gifts made him a prime favorite; and through the influence of Fox it was that in 1780 he was returned to parliament for the borough of Stafford. In his politics he faithfully followed Fox, and the whig party from time to time had good service from their brilliant recruit. He never failed to amuse the house, and when stirred by the trumpet-call of a great occasion, he was capable of rising to heights of noble eloquence. In particular, his famous speech urging the impeachment of Warren Hastings (q. v.), is still traditionally remembered as perhaps the very grandest triumph of oratory in a time prolific of such triumphs.

In 1792 Sheridan lost his wife; and three years after, he was married again to a Miss Ogle, who brought him £5,000, to Sheridan no doubt welcome, though trifling as a relief to the difficulties in which he had become involved, and which more and more continued to accumulate upon him. Always the most reckless and improvident of mortals, he did not improve with time. His later years were years of wretched struggle, of which debt, duns, and dissipation may furnish a convenient alliterative summary. His health failed him with his fortunes; and his friends, not finding him in his sickness and adversity quite so amusing as formerly, naturally failed him also—notably and shamefully, the prince regent, whose dull brains over the wine cup he had many a time been made use of to brighten. Some honorable exceptions there were, among whom the poets Rogers and Moore may be mentioned as steadily kind to him to the last. He died in London on July 7, 1816, in his 65th year.

See his biography by Moore, and (for a just and delicate appreciation of his genius) Hazlitt's *Lectures on the Comic Writers*; also, Stainforth's edition of his works (1874).

SHERIDAN, THOMAS, 1721-88; b. near Dublin Ireland; educated at Trinity college. In 1743 he entered the dramatic profession, played at Drury Lane and Covent Garden; managed the Dublin theater until 1754, when a political riot occurring in the theater compelled him to retire. With the exception of one or two brief re-appearances on the stage, the rest of his life was spent as a lecturer on elocution at Oxford, Cambridge, and elsewhere. He published a *Life of Swift*, a dictionary, and lectures on reading and elocution.

SHERIFF (Arab. noble), designates, among Moslems, a descendant of Mohammed, through his daughter Fatima and Ali. The title is inherited both from the paternal and maternal side; and thus the number of members of this aristocracy is very large among the Moslems. The men have the privilege of wearing green turbans, the women green veils, and they mostly avail themselves of this outward badge of nobility—the prophet's color—while that of the other Moslems' turbans is white. Many of these sherifs founded dynasties in Africa; and the line which, nowadays, rules in Fez and Morocco, still boasts of that proud designation.

SHERIFF (A.-S. *scir-gerēfa*, the reeve or fiscal-officer of a shire; compare Ger. *graf*), in English law, is an officer whose duties are chiefly ministerial (for he has only a few trifling judicial duties). The office is of great antiquity. The sheriff was formerly chosen by the inhabitants, though probably requiring confirmation by the crown. But popular elections for that purpose were put an end to by a statute of 9 Ed. II., which enacted that in future the sheriffs should be assigned by the chancellor, treasurer, and

judges. Ever since that statute, the custom has been, and now is, for all the judges of the common-law courts, with the lord-chancellor, and chancellor of the exchequer, to meet in the court of exchequer at Westminster on the morrow of All Souls, and then and there propose three persons for each county to the crown. This is called the pricking of the sheriffs, and the crown afterward selects one of the three nominated, and appoints him to the office. A sheriff continues in office for one year only, and cannot be compelled to serve a second time. The office is not only gratuitous, but compulsory, for if the person appointed refuses, he is liable to indictment. In practice, country gentlemen of wealth are appointed. In the city of London, the sheriffs are appointed not by the crown, but by the citizens. The sheriff has important official duties in elections of members of parliament. He is, by his office, the first man in the county, and superior to any nobleman while he holds office.

The office of sheriff is one of the few which may be traced back to the Saxon times, and it appears originally to have been the same both in England and Scotland. The sheriff was (under the earl and next to the bishop) the chief man of the shire, and seems to have possessed unlimited jurisdiction to keep the peace; to have presided in all the courts; to have punished all crimes, and have redressed all civil wrongs. This extensive jurisdiction, gradually acquired at the cost of lesser local courts, has been gradually infringed upon, partly by the exercise of the royal prerogative, and partly by parliament. But in England it suffered more from the appointment to the office of men unfit to exercise judicial powers, and from the consequent usurpation of their functions by the supreme courts. The same causes operated in Scotland, though to a less extent. In England, they resulted in the almost entire abolition of the judicial functions of the sheriff. In Scotland, they resulted in his being deprived of the more important parts of the criminal jurisdiction, particularly of the power to punish by death; and in his civil jurisdiction being limited mainly to questions affecting movables. In both countries, the office was usually hereditary, which tended to a separation of the duties of the office into the honorary and the laborious—the former being performed by the principal sheriff, and the latter by the deputy. In Scotland, this separation was completed by the act of George II., which entirely separated the offices, by the transference of the power of appointing the deputy from the principal sheriff to the crown. In England, this complete separation has never become necessary, from the fact of the sheriff's power having been much more crippled than in Scotland. Indeed, in England, so purely honorary and ministerial has the office become, that it has been held by a female, and in Westmoreland, the office was hereditary down to 1849.

In the United States, a sheriff is an officer of the state and county, and not of the general government; he has no judicial functions unless power to assess damages in certain cases with the aid of a jury is considered as such; and he is almost invariably elected by popular vote. The deputies of a sheriff are responsible to him only while he remains responsible to the executive and the public (see OFFICE). The duties and functions of the sheriff are in general much the same in this country as in England.

SHERIFF-MUIR, a name given to several moors in Scotland on account of the "wapinschaws" which used to be there held, under the superintendence of the sheriff. The only moor of this name which appears prominently in Scottish history is situated in Perthshire, on the northern slope of the Ochils, 2 m. n.e. of Dunblane, and was the site of the great battle between the adherents of the houses of Stuart and Hanover, Nov. 13, 1715. The former, who consisted of the northern clans under the earl of Seaforth, and the western clans under Gen. Gordon, numbering about 9,000 in all, were on their march southward, under the leadership of the earl of Mar, to join the Jacobites who had risen in the n.w. of England, when they were met by the duke of Argyle at the head of 3,500 disciplined troops. After lying under arms all night, the Macdonalds, who formed the center and right of the Highland army, attacked the left of their opponents, and routed it so completely that the fugitives fled with all speed to Stirling, carrying the news that Argyle had been totally defeated. Argyle, however, with his dragoons had meantime driven the left of the Highlanders back for 2 m., when the right and center returned from the pursuit, and took him in rear; he then skillfully withdrew his men to a place of shelter, and remained facing his opponents till the evening, when he retired to Dunblane, and next day to Stirling. About 500 were slain on each side. As a mere battle, the victory lay with the Highlanders; but it was so little decisive, that it paralyzed the action of the Jacobites almost as effectually as a defeat would have done.

SHERLOCK, THOMAS, D.D., an English prelate, was the son of Dr. William Sherlock, dean of St. Paul's, and was born in London in 1678. He was educated at Eton and Catharine hall, Cambridge, where he took the degree of M.A. in 1701. In 1704 he obtained the mastership of the temple; in 1714 he became vice-chancellor of his college, taking the degree of D.D. in the same year; and in 1716 dean of Chichester. Eleven years later he was raised to the see of Bangor, was transferred to that of Salisbury in 1734, and in 1748 to that of London. He died in 1761. Sherlock was a strenuous tory, and supported the church-and-state politics of his day with a sort of dull dignity. He displayed a good deal of diplomatic skill in his different official positions, whence Bentley nicknamed him "Cardinal Alberoni;" his eloquence and learning were likewise of a very superior order, as may still be ascertained from his 4 vols. of *Sermons* (1755-76), which were highly praised in their day.

SHERLOCK, WILLIAM, D.D., 1641-1707; b. London; graduated at Cambridge and became rector of St. George's parish, London, 1669; was made a prebendary in St. Paul's, master of the temple, and rector of Therfield. After the revolution he was suspended for refusing the oath of allegiance to William and Mary, but afterward took it, defending himself by publishing the *Allegiance of the Two Sovereign Powers*, to which the replies were almost innumerable. In 1691 he became dean of St. Paul's.

SHERMAN, a co. in n.w. Kansas, having the state line of Colorado for its w. boundary; 1080 sq. m.; pop. '90, 5261. Co. seat, Goodland.

SHERMAN, a co. in central Nebraska, drained by the Loup fork of the Platte river, and other streams; 576 sq. m.; pop. '90, 6399. Co. seat, Loup.

SHERMAN city and co. seat of Grayson co., Tex.; on the Houston and Texas Central, the Missouri, Kansas, and Texas, the St. Louis Southwestern, and the Texas and Pacific railroads; 64 miles n. of Dallas. It is the seat of Austin college (Pres.), North Texas female college (Meth. Epis.), Mary Nash college, Burdette college, and St. Joseph's and Le Tellier academies, and has electric lights, waterworks supplied from deep wells, cotton seed oil mill (cost \$500,000), three cotton gins, three flour mills, iron foundries and machine shops, cotton compress, seamless bag factory, planing mills, marble and brick works, and carriage and wagon factories. Pop. '90, 7,335.

SHERMAN, FRANK DEMPSTER, was born at Peekskill, N. Y., May 6, 1860. He studied at Columbia and Harvard University; and was elected fellow of Columbia in 1887, and became instructor in the Columbia School of Architecture. He has written *Madrigals and Catches* (1887); *Lyrics for a Lute* (1890); and, with John Kendrick Bangs, *New Waggings of Old Tales* (1888).

SHERMAN, JOHN, b. Ohio, 1823; brother of Gen. W. T. Sherman; studied law; admitted to the bar in 1844, elected a member of the 34th, 35th, and 36th congresses. In 1860 he was again elected to the house of representatives, but was made senator from Ohio in the following year, and re-elected for the two following terms. On the accession of President Hayes, Senator Sherman was appointed to a place in the cabinet as secretary of the treasury, in which position he had the satisfaction of superintending the resumption, by the government, of specie payments, Jan. 2, 1879, after a suspension of 17 years. In the exciting campaign for president in 1880, Secretary Sherman was a prominent candidate for nomination by the republican party at the convention held at Chicago in June; but it becoming apparent that his nomination was impossible, owing to the formidable strength of the friends of Gen. Grant, a combination was effected between the Sherman and Blaine parties in the convention, and the compromise pursued which resulted in the nomination of Gen. Garfield. On Mar. 4, 1881, Mr. Sherman took his seat as U. S. senator from Ohio. A leading candidate for the presidential nomination, 1888, he was defeated only by the transference to Harrison of the Blaine vote. His *Reminiscences* were published in 1895. For an account of the coinage bill which bears his name, see MONEY.

SHERMAN, ROGER, 1721-93; b. Mass.; a shoemaker, who in 1743 settled in Connecticut, where he was a store-keeper. He became county surveyor of lands in 1745; but taking up the study of law, was admitted to the bar in 1754. He served a number of terms in the assembly, became a judge of the court of common pleas in 1759, and was appointed to the same office 6 years later at New Haven, whither he had removed in 1761; and he held the office till 1789, part of the time sitting on the superior court. He was a member of congress from 1774 till his death, one of the committee of 5 appointed to draft the declaration of independence, a member of the boards of war and ordnance, and of several important committees. He helped codify the laws of Connecticut, and to draw the articles of confederation; was a member of the constitutional convention of 1787, U. S. senator, 1791-93, and mayor of New Haven from 1784 to his death. He was a man of strong practical sagacity.

SHERMAN, SIDNEY, 1805-73; b. Mass.; lineally a descendant from Roger Sherman; received a common school education; established himself in business in New York, but removed thence to Cincinnati, Ohio, in 1831, and again to Newport, Ky. In 1835 he raised a company to aid Texas in her struggle for liberty and independence, equipping his men and supplying two pieces of artillery. He was engaged in the conclusive battle of San Jacinto, in which he commanded the left wing of the Texan force, and first raised the exciting battle-cry "Remember the Alamo!" In 1837 he removed to Texas, and five years later was sent to congress from Harris co., that state. He planted the first railroad on Texas soil in 1854. During the war of the secession he organized the defense of Galveston.

SHERMAN, THOMAS WEST, 1813-79; b. Rhode Island; graduated at West Point in 1836; commissioned 2d lieutenant in 3d artillery. He was engaged in the Mexican war, and was made brevet-major for gallant conduct at the battle of Buena Vista. At the outbreak of the civil war he was appointed lieutenant-colonel of the 5th artillery, but in 1863 returned to the 3d artillery as its colonel. He was made brigadier-general of volunteers; commanded the land forces in the operations against Port Royal and the Sea islands in Oct., 1861; and in December of the same year occupied Beaufort and Tybee island. He was under

Gen. Banks at Port Hudson in 1863, where he lost a leg. In 1870 he was placed on the retired list with the full rank of maj.gen. in the U. S. army.

SHERMAN, WILLIAM TECUMSEH, an American general, was born in Lancaster, Ohio, Feb. 8, 1820. He was the son of Charles R. Sherman, a lawyer, and Mary Hoyt, both of Norwalk, Conn., and descended from Hon. Samuel Sherman, brother of Rev. John (q.v.), emigrants from Dedham, England, in 1634. From Capt. John Sherman, a cousin of Samuel's, are descended Roger Sherman, a signer of the Declaration of Independence, William M. Evarts, Ex-Senator Hoar, and many others of national fame. Charles Sherman died in 1829, and the family of ten children were scattered, William going to live with Hon. Thomas Ewing. In 1836 he received an appointment to West Point and graduated in 1840. The same year he was commissioned second lieutenant of the Third Artillery, and sent to Florida. In 1847 he was sent to California, where he was assistant adjutant general until 1850. In 1853 he resigned from the army and entered the banking business in San Francisco, afterwards removed to New York, practised law for a time in Kansas, and in 1858 was President of the Louisiana Military Academy. In 1861 he left the South and went to St. Louis, but was soon called upon by President Lincoln to return to the army, being first commissioned Colonel of the Thirteenth Regular Infantry, and a few weeks later brig. general of volunteers, and was in command of a brigade at the first engagement at Bull Run. A few weeks later, at General Anderson's request, he was appointed to that officer's staff in the Department of the Cumberland, and on the failure of the General's health in October, succeeded to the command. It was while in this position that Sherman realized the magnitude of the war, and when asked by the secretary how many men he needed, replied, "200,000 to finish the war in this section." This remark was taken up by the press and he was charged with insanity, finally removed from command with orders to report to General Halleck in St. Louis. In February, 1862, he was ordered to the command of the district of Paducah, Kentucky, and in April was in the battle of Shiloh (q.v.), at which he was wounded in the hand, and had three horses shot from under him. He displayed such energy and skill, that Grant, in a letter to the War Department, said of him: "To his individual efforts I am indebted for the success of that battle." Soon after he was commissioned major-general of volunteers, and took a prominent part in the siege of Corinth. In July he was placed in command at Memphis, and in December was ordered to the mouth of the Yazoo, to take Vicksburg from that direction. This was unsuccessful, but he rendered important service in Mississippi in April and May, 1863. In July he was with Grant at the siege of Vicksburg, and marched against Johnston, driving him out of Jackson a few days later. Soon after this he was made brigadier-general of the regular army. In October he was appointed commander of the Department of the Tennessee, and by making rapid marches he soon joined Grant at Chattanooga, doing important work at Missionary Ridge, and compelling General Longstreet to raise the siege of Knoxville and retreat to Georgia. Sherman then returned to Vicksburg, making various important movements, the most important, perhaps, being the cutting of the railroad lines centring in Meridian, Miss. When Grant was appointed commander-in-chief of the armies of the U. S. in March, 1864, Sherman was given the command of all the armies between the Mississippi River and the Alleghany Mountains, with instructions to move against General Johnston stationed at Dalton, Georgia. He organized at Nashville an army comprising 100,000 men, with which he undertook his invasion of Georgia. He fought the confederates under Gen. Joseph E. Johnston at Dalton, Resaca, Cassville, Dallas, and in the Kenesaw mountains, from May 12 to the beginning of July, when he occupied Marietta, and defeated Gen. Hood, who had superseded Johnston, in several hard-fought battles, winding up his triumphant campaign Sept. 1, when Atlanta was evacuated after a siege of 40 days; on Aug. 12 he was commissioned maj.gen. in the regular army. Gen. Sherman now rested his army until November, when he undertook the "march to the sea" which has chiefly perpetuated his fame. On Dec. 13 he was at Savannah, when he stormed fort McAllister and captured the city. Making the latter his base for future operations, he marched into South Carolina, capturing Columbia, Feb. 17, 1865; Cheraw, Mar. 3; and, continuing into North Carolina, fought battles at Averysboro and Bentonville, and captured Goldsboro on Mar. 23. He took Raleigh, April 13, and on the 26th received the surrender of Gen. Joseph E. Johnston at Durham Station. He continued his march to Richmond and Washington, where it concluded May 24, having extended over 2600 miles. This march has been represented by writers of the Confederate side as one of lawlessness and inhumanity, but such outrages as were committed were mostly of them the work of the so-called "bummers" or followers in the rear of the army, and were without Sherman's knowledge and contrary to his instructions. He says in his *Memoirs* that "while such public buildings as could be converted to hostile uses were totally destroyed, little or no damage was done to private property." After the grand review in Washington, his army was disbanded. In 1866 he succeeded Gen. Grant as lieutenant-general, and on Grant's becoming president, was made general of the army, retiring from active duties in 1883. In 1871 he made a tour through European and Oriental countries, and was everywhere received with distinction. The last years of his life were spent in New York, where he died in Feb., 1891. See his *Revised Memoirs* published in 1891.

SHERRING, M. A., 1826-80; b. England; ordained in 1852; went to Benares, northern India, as a missionary of the London missionary society, 1853; was stationed at Mirzapore in 1856; returned to Benares in 1861, where he remained until his death. He visited England in 1867 and 1876. He published, *The Indian Church during the Mutiny; The Sacred City of the Hindus; The Tribes and Castes of India as Represented in Benares; The History of Protestant Missions in India.*

SHERRY. See WINE.

SHERWIN, THOMAS, LL.D., 1799-1869; b. N. H.; graduated at Harvard college in 1825; was principal of an academy at Lexington, Mass., 1825-26; tutor at Harvard, 1826-27; spent several months in engineering and surveying; taught a private school for boys in Boston for a year; and afterward had charge of the Boston English high school; was one of the founders of the American institute of instruction in 1830. He published an *Elementary Treatise on Algebra; Common School Algebra.*

SHERWOOD, MARY MARTHA (BUTT), 1775-1851; b. England; educated by her father, the Rev. Geo. Butt. Her first book was published, against her wishes, when she was 17 years of age. She married Capt. Henry Sherwood; resided in India, 1804-18, and afterwards in England. She wrote 90 volumes, including stories for children, novels, and works of laborious research. Among the best known are: *Little Henry and his Bearer; Roxobel; and The Lady of the Manor.*

SHERWOOD, WILLIAM HALL, pianist, b. in Lyons, N. Y., Jan. 31, 1854. He studied under William Mason, under Kullak, Wuerst, Richter, and Liszt in Germany, and played successfully in Europe. In 1876 he returned to the United States and settled in Boston, where he became connected with the New England Conservatory of Music. In 1889 he removed to Chicago to become director of the pianoforte department of the Conservatory of Music. Mr. Sherwood is one of the members of the American College of Music, and has labored to encourage American music. He has written several compositions for the pianoforte.

SHERWOOD FOREST, a stretch of hilly country in the w. of Nottinghamshire, lying between Nottingham and Worksop, and extending about 25 m. from n. to s., and 6 to 8 m. from e. to west. It was formerly a royal forest, and the traditional scene of many of the exploits of the famous Robin Hood and his followers; but it is now almost wholly disafforested, and is occupied by gentlemen's seats and fine parks. The town of Mansfield and a number of villages are situated within the ancient bounds. Numerous remains of the old forest are still to be seen.

SHET LAND, ZETLAND, or anciently **HIALTLAND**, and likely the ultima thule of the Romans, a group of about 100 islands, islets, and rocks, 23 of which are inhabited. They lie between the Atlantic and the North sea, between lats. 59° 50' and 60° 52' n., and between longs. 0° 53' and 1° 15' w.; but Fair isle, which belongs to Shetland, lies to the s., and is about midway between Orkney and Shetland. The group is about 50 m. n.e. of Orkney, and 210 m. w. of Norway. Area, 551 sq. miles. The largest is Mainland; others are Unst, Fetlar, Bressay, Whalsay, Papa Stour, Barra, and Foula. Pop. in 1811, 22,379, and in '71, 31,608, with 141.2 females to every 100 males, and 5667 inhabited houses. In '91, the population of the group was 28,711. Lerwick, on Mainland, 272 m. n. of Edinburgh, and 95 n. of Wick, is the chief town of Shetland, and has a custom-house, law courts, and other public offices. Its pop. in '91 was 3783. It has a fine natural harbor, and has steam communication with Granton for passengers, mails, and a large part of the exports from and imports into Shetland. Fort Charlotte, now used as a prison, court-house, etc., is at the n. end of the town, and adds to its picturesque-ness. Lerwick has hotels, licensed public-houses, and several lodging-houses. The chief imports are oatmeal, flour, tea, tobacco, spirits, sugar, cottons, woolens, timber (chiefly from Norway), tar, salt, etc. The manufactures are chiefly hosiery and shawls, and the exports, besides these, are cattle, fish, and eggs.

Fishing for cod, ling, herring, is the chief industry, giving employment to about 300 fishing-boats, with 7500 fishermen and boys. Much attention is given to the rearing of cattle, sheep, and ponies, the little Shetland ponies being famous throughout the world. Almost all the small tenants practice spade cultivation. Seals and bottle-nosed whales are often caught. The spinning-wheel is common, but the spindle is still in use in some parts. The sheep and ponies run at large on the scatfield or common, and have registered marks; but many large tracts have been inclosed and drained, and now rear first-class cheviot and black-faced sheep. The *riolin*, a sandal of untanned leather, is still worn. Some lands are still held runrig, and some islanders on the w. still hold their stock as steel-bow. In certain districts, till a very late period, the poor, by the Norse law, went from house to house, and stayed a longer or shorter period in each, according to the size of the farm. The Shetland dialect is a soft and pleasant English, but contains many peculiar Norse words. Many of the people still eat their fish wind-dried and slightly tainted. Young men from Shetland are employed as sailors in the Peterhead and Dundee whalers, or at some of the large shipping ports of the kingdom. They are intelligent, sober, and sedate, and are much liked as seamen. Shetland is still subjected to the *truck* or barter system in local commercial transactions.

Shetland with Orkney forms a county, which sends one member to parliament. In 1893 Shetland had 5445 horses, 18,876 cattle, 99,699 sheep, and 2904 pigs; 9438 acres in oats and barley, the only grain crops; 3267 acres in potatoes, and 1452 acres in turnips. Free landed property is termed udal, and the proprietor an udaler.

The surface is rugged and wild, and often sterile. The coasts are abrupt, and cut with deep bays or voes, and caves. The rocks are mainly gneiss, clay-slate, sandstone, granite, sienite, mica-slate, serpentine, and diallage. The highest hills are Ronas, 1500 ft., and one of five in Foula, 1400. The coast cliff scenery is very fine, and none in Scotland surpasses that about Papa Stour. The climate is moist and variable, and snow and frost are of short duration. South-w., s., and n. winds prevail.

Though we know little or nothing of the original inhabitants of Shetland, the physiognomy, character, and language of the present point to a Norse or Scandinavian descent. In Unst, etc., have been found cairns over long and short stone coffins, with skeletons, clay urns, weapons, and stone vessels. Tumuli and burned stones and earth are frequent, and contain remains of rude buildings and stone implements. Circular strongholds of unhewn stone, called burghs or "broughs," are very numerous, generally on a cliff or headland, but also on artificial islands in fresh-water lochs. Mouse isle has the most perfect "brough" known. In Sandsting occur very rude underground houses, with the rudest stone implements. In Bressay was found a stone of the Christian period, with an Ogham inscription. Monoliths are rather frequent. Stone circles are rare, and never large.

SHEVCHENKO, TARAS GRIGOROVICH, a noted writer of Little Russia, b. Feb. 25, 1814, in the government of Kiev. In the face of every disadvantage he managed to pick up an education. Having shown a talent for painting, he was apprenticed to a house decorator, with whom, in 1832, he moved to St. Petersburg. In this city he became acquainted with a number of poets, who recognized in him a taste for poetry and secured his freedom. In 1847, on account of certain writings which displeased the government, he was banished, and for ten years lived among the soldiers of the Russian army. His release was secured but he died in St. Petersburg, Feb. 26, 1861. Among his writings are *Kolzar* (1840); *Hasidamaki* (1841); *Hamalia* and *Maiak*.

SHEW-BREAD, "bread of the presence," in the Jewish ritual; 12 loaves of unleavened bread, sprinkled with frankincense and placed in the "holy place," on a table of acacia wood overlaid with gold. They were exchanged for fresh loaves every Sabbath, and, after the incense on them had been burned as an oblation, were eaten by the priests. Yet in extreme cases they might be given to hungry men. Wine was placed on the table with the bread.

SHIAHS, or **SHEEAHS**. See **SHITES**.

SHIAWASSEE, a co. of s.e. Mich., intersected by the Shiawassee river, drained also by the Looking-Glass and Maple rivers, and intersected by the Detroit, Grand Haven, and Milwaukee, and the Michigan Central railroads; 528 sq. m.; pop. '90, 30,952. Its surface is undulating and extensively covered with forests of oak, ash, beach, and sugar-maple. Soil sandy but fertile, producing wheat, maize, oats, and hay. Co. seat, Corunna.

SHIB BOLETH (Heb. ear of corn, or stream), the test-word used by the Gileadites, under Jephthah, after their victory over the Ephraimites, recorded in Judges xii. 6. It appears that the latter could not pronounce the *sh*, and, by saying sibboleth, betrayed themselves, and were slaughtered mercilessly. It may be noticed that all those Hebrew names in the Old Testament which commence with the *sh*, have now, through the inability of the Septuagint to render this sound in Greek, become familiar to us through the versions that flowed from it, as beginning with the simple *s*, e.g., Sem, Simon, Samaria, Solomon, Saul, etc. The word sibboleth is used in modern languages in the sense indicated: viz., a test of speech and manners of a certain party or class of society.

SHIDZUOKA, a city in Suruga province, Japan, formerly called Sumpu or Fuchiu, noted even in mediæval times. Iyéyasu, the great unifier of Japan, made it the capital of his fief, and after establishing his family in Yedo, made it the seat of his labors for the revival of literature and the arts of peace, 1604-16, during which time many Europeans visited the city and described it in their works. In 1868 the tycoon and his followers were ordered to make this city, their former ancestral home, their abiding place, its name Fuchiu being changed to Shidzuoka, which means Peaceful Slope. The surrounding region is the richest tea-district in Japan. Inlaid lacquer-work and split ware are largely manufactured. Looming before the city is the sacred Fujiyama. Six miles distant is the famed Kuno San, and the sea-port of Shimidzu. Christian churches and flourishing schools on the American plan attest the influence of the teachers from the United States who have resided there.

SHIEL, LOCH, in the w. of Scotland, forms part of the boundary between the counties of Argyle and Inverness, separating the district of Moidart on the n. from those of Sunart and Ardgower on the south. The head of the loch is about 16 m. w. of Fort William. It is 17½ m. long, and about 1 m. broad, and communicates with the sea by Shiel Water and loch Moidart.

SHIELD, a piece of defensive armor, borne on the left arm, to ward off the strokes of the sword and of missiles. It has been constantly used from ancient times through the middle ages, till the invention of fire-arms rendered it useless. The large shield worn by the Greeks and Romans (Gr. *aspis*, Lat. *clipeus*) was circular, and often ornamented with devices. Another form of shield (Lat. *scutum*) was used by the Roman heavy-armed infantry, square, but bent to encircle the body. The early shield of knightly escutcheon of the middle ages was circular in outline, and convex, with a boss in the center; the body generally of wood, and the rim of metal. In the 11th c., a form came into use which has been compared to a boy's kite, and is said, with some probability, to have been brought by the Normans from Sicily. It was on the shields of this shape that armorial designs were first represented. These shields were in reality curved like the Roman *scutum*; but after heraldry began to be systematized, we generally find them represented on seals, monuments, etc., as flattened, in order to let the whole armorial design be seen. In the 13th c., this long and tapering form began to give place to a pear-shape, and a triangular or heater-shape. During the 14th c., these new forms became more generally prevalent, and the heater-shape, which was perhaps most frequently represented on armorial seals, began to approach more to an inverted equilateral arch. The same variety of forms, with some modifications, continued during the 15th c., a tendency appearing in all representations of the heater-shaped shield to give it more breadth below. A notch was often taken out in the dexter chief for the reception of the lance, in which case the shield was said to be *à bouche*. Subsequent to the middle of the 14th c., when the shield came to be depicted as surmounted by the helmet and crest, the shield is often represented *couché*, that is, pendent from the corner, an arrangement said to have originated in the practice of competitors hanging up their shields prior to a tournament, where, according to De la Colombière, if they were to fight on horseback, they suspended it by the sinister chief, and if on foot, by the dexter chief. A square shield denoted a knight-banneret. Shields of arms were often represented as suspended from the *guige*, or shield-belt, which was worn by the knights to sustain the shield, and secure it to their persons.

After the introduction of fire-arms made shields no longer a part of the warrior's actual equipment, the form of the shields on which armorial bearings were depicted, on seals, monuments, brasses, etc., varied greatly in form, and generally speaking, became gradually more tasteless, fanciful, and unmeaning. A tendency has, however, been shown in recent heraldry to recur to the artistic forms prevalent in the 14th and 15th centuries.

In early times, shields of the form which generally prevailed at the period were exhibited on the seals and monuments of ladies; but about the 15th c., the practice began, which afterward became usual, of unmarried ladies and widows (the sovereign excepted) bearing their arms on a lozenge instead of a shield.

The heraldic insignia of towns, corporations, etc., as well as individuals, are placed on shields. The bearing of merchants' marks (q.v.) in a shield was prohibited by the heralds of the 16th c. under severe penalties. See illus., **HERALDRY**, vol. VII., also **ANCIENT ARMOR**, vol. I.

SHIELDS, CHARLES WOODRUFF, D.D., b. Ind., 1824; grandson of Patrick Henry Shields; graduated at the college of New Jersey, 1844, and at Princeton seminary, 1847; pastor of First Presbyterian church, Hempstead, L. I., 1849-50; and of the Second Presbyterian church, Philadelphia, 1850-65; professor of the relations of religion and science in the college of New Jersey from 1865. He has edited *The Book of Common Prayer*, as amended by the *Westminster Divines*; and is author of *Philosophia Ultima*, a work of extensive scope and deep reasoning; *Final Philosophy*, *Order of the Sciences*, *The Historic Episcopate* (1894); *The Question of Unity* (1894), etc.

SHIELDS, JAMES, 1810-79, b. Ireland; came to this country in 1826; practiced law at Kaskaskia, Ill., 1832; member of the legislature, 1836; state auditor, 1839; judge of the supreme court, 1843; commissioner of the general land office, 1845. He served in the Florida war and in Mexico; brevetted for gallantry at Cerro Gordo, and Chapultepec, severely wounded at both places. He was governor of the territory of Oregon, 1848; U. S. senator from Illinois, 1849-55; removed to Minnesota and was senator from that state, 1858-60. From there he went to California, returned during the war, and took command of Gen. Lander's division at his death; was wounded at the battle of Winchester. He was appointed U. S. senator from Missouri in 1879 to fill out the unexpired term of David H. Armstrong.

SHIELDS, NORTH, a seaport of Northumberland, on the n. bank of the Tyne, and at the mouth of that river, opposite South Shields, and 8 m. e.n.e. of Newcastle. It stretches more than a mile along the river-bank, and is rapidly extending westward. Possessing all the usual institutions, as churches, schools, theater, custom-house, sailors' home, etc., it is not distinguished by any striking architectural features, and it is indebted to its rising trade and manufactures for its importance. Coal and coke are exported and timber, grain and esparto grass are imported. North Shields has two docks, one of 55 acres and the other of 24 acres. The total tonnage entering and clearing the ports of North and South Shields in 1893 was 3,540,869. The building of wood and iron vessels, and tug-steamers, the manufacture of the anchors, chain-cables, ropes, blocks, masts, and other articles of ship-furniture, are the principal branches of industry. North Shields

has an extensive public free library and news-room. It forms part of the borough of Tynemouth. Pop. of borough of T., '91, 46,267; of North S., about 6,000.

SHIELDS, PATRICK HENRY, b. in Va., May 16, 1773, studied law at Hampden-Sidney and William and Mary colleges. He moved to Indiana territory and became first judge of Harrison co. in 1808. He was a member of the constitutional convention at Corydon in 1816. He was active in every branch of the organization of the state. He died June 6, 1848.

SHIELDS, SOUTH, a county, municipal and parliamentary borough, and market t. of Durham, on the s. bank of the Tyne, and at the mouth of that river, 9 m. e.n.e. of Newcastle by river and railway. The town stretches for 2 m. along the side of Shields harbor, which is lined with numerous dockyards and manufactories. The Tyne dock, containing 50 acres of water space, and fourteen other docks are within the borough. In 1854 work was begun on the south pier, which is to be a breakwater about a mile in length, and in 1895 it had not yet been completed. The market-place is a spacious square in the center of the town, near which is the large church of St. Hilda. The town, with North Shields, is one of the chief ports in the kingdom for the building of iron ships, iron screw-steamers, and tug-steamers. There are large alkali, bottle, and glass works, and every kind of manufacture connected with shipping. A steam-ferry for passengers and carriages plies day and night between the two towns, one on the n., and the other on the s. side of the entrance to the Tyne. Shields bar has been removed by dredging, in order, with the piers, to form a harbor of refuge. The sea-coast in the neighborhood is interesting from the rocks and caves. The lifeboat is a South Shields invention. South Shields sends one member to parliament. South Shields possesses a large public library, with news-room, and large hall for public meetings, a marine school, and a park of 45 acres. There is an extensive colliery, that of St. Hilda's; a school-board; and Tyne pilotage board, comprising representatives of North Shields, South Shields, and Newcastle. A large new theater has recently been erected. Pop. '61, 35,239; '91, 78,431.

SHIITES ("sectaries," from the Arab. *shiah*, *shiat*, a party, a faction), the name given to a Mohammedan sect by the "Sunnites" (q.v.), or orthodox Moslems. The Shiites call themselves "followers of Ali," and have special observances, ceremonies, and rites, as well as particular dogmas of their own. The principal difference between the two consists in the belief of the Shiites that the imamat, or supreme rule, both spiritual and secular, over all Mohammedans, was originally vested in Ali Ibn Abi Taleb, and has been inherited by his descendants, to whom it legitimately now belongs. The Persians are Shiites; the Turks, on the other hand, are Sunnites; and this division between the two nations dates chiefly from the caliphate of Mothi Lilla, the Abasside, in 363 H., when political dissensions, which ended in the destruction of Bagdad and the loss of the caliphate of the Moslems, assumed the character of a religious war. The Shiites themselves never assume that (derogatory) name, but call themselves *Al-Adeliat*, "Sect of the Just Ones." They are subdivided again into five sects, to one of which, that of Haidar, the Persians belong; the present dynasty of Persia deriving its descent from Haidar, a descendant of Ali. Ali himself is by some of them endowed with more than human attributes. The Shiites believe in metempsychosis and the descent of God upon his creatures, inasmuch as he, omnipresent, sometimes appears in some individual person, such as their imams. Their five subdivisions they liken unto five trees, with seventy branches; for their minor divisions of opinions, on matters of comparatively unimportant points of dogma, are endless. Yet in this they all agree, that they consider the caliphs Abu Bekr, Omar, and Othman, who are regarded with the highest reverence by the orthodox Sunnites, as unrighteous pretenders and usurpers of the sovereign power, which properly ought to have gone to Ali direct from the prophet. For the same reason they abominate the memory of the Ommayad caliphs, who executed Husain, a son of Ali, and they still mourn his death at its anniversary. They likewise reject the Abasside caliphs, notwithstanding their descent from Mohammed, because they did not belong to Ali's line.

SHIKARPUR, an important trading t., and probably the most populous t., in Sinde, in lat. 27° 57' n., long. 68° 45' e., half way between Multan and Kurrachi. The district in which it stands is so low and level that, by means of canals, which are supplied from the Indus, it is flooded every season. Its climate, notwithstanding, is said to be not unhealthy. The inundated quarters are extremely fertile and produce great crops. Shikarpur is situated on one of the great routes by the Bolan pass from Sinde to Afghanistan, and the transit trade to that country and to Khorassan is important. The bankers and financiers of Shikarpur are known and trusted from Astrakhan to Calcutta. There are manufactures of carpets and a coarse cotton cloth. Shikarpur is the chief town of the district of the same name, which has an area of about 10,000 sq. m. and, '81, 852,986 inhabitants. Pop. of the town, '91, 42,004, — 25,846 of whom were Hindus, and 16,113 Mohammedans.

SHILKA. See AMOOR.

SHILLABER, BENJAMIN P., b. N. H., 1814; was a printer at Dover, N. H., in 1830, and in 1837 went to Demerara, Guiana, as a compositor, and remained there three years. From 1840 to 1847 he was in the printing office of the *Boston Post*, and after that time for three years was connected with the same paper editorially. It was at this period that he wrote over the name "Mrs. Partington" and gained a reputation as a

humorist by the quaintness of his style and matter. Between 1850 and 1853 he tried his hand at newspaper proprietorship, in the *Pathfinder* and *Carpet-Bag*, but returned to the *Post*, 1853-56. From 1856 he was for ten years one of the editors of the Boston *Saturday Evening Gazette*. Shillaber wrote *Rhymes with Reason and Without*; *Poems*; *Life and Sayings of Mrs. Partington*; *Knitting-Work*, and other volumes. He d. 1890.

SHILLELAH is the Irish name of an oaken cudgel or sapling said to be taken from the forest of *Shillelah*, Ireland, famous for its oaks; hence, any stick or club used for cudgeling.

SHILLIBEER. See OMNIBUS.

SHILLING, the name of a money in use throughout many European states, partly as a coin and partly as a money of account. In all probability the name, as well as the thing itself, is derived from the Roman *solidus*, which, with other remains of Roman institutions, was adopted by the Franks and other Germanic nations. See PENNY, SOLIDUS. Others give more fanciful derivations, as from *schellen*, to ring, on account of the particularly clear ring of the coin, and from St. Kilian, whose effigy was stamped on the shillings of Würzburg. The *solidus-shilling* of the middle ages has suffered various degrees of diminution in the different countries. Thus the English silver shilling is $\frac{1}{20}$ of a pound sterling; the Danish copper one is $\frac{1}{16}$ of a ryks-daler, and $=\frac{1}{4}$ d. sterling; and the Swedish shilling is $\frac{1}{16}$ of a ryks-daler, $=\frac{1}{4}$ d. sterling. In Mecklenburg, Sleswick-Holstein, Hamburg, and Lübeck the shilling is used as a fractional money of account (the $\frac{1}{10}$ of a mark, $\frac{1}{18}$ of a thaler), and as small silver change (each coin being a shade less in value than 1d. sterling). The French *sou* is another representative of the solidus. See POUND, MINT.

SHILOH, a city of Ephraim, on a hill n. of Bethel and e. of the great northern road; the abode of the tabernacle and ark from the conquest to the death of Eli, after which it sank into insignificance, and is several times spoken of in Scripture as having been visited with judgments from God because of the iniquities committed there while it was the place consecrated to his worship. Dr. Robinson identified it with Seilun.

SHILOH, BATTLE OF. So named from a church situated where the battle was fought, near Pittsburgh Landing, Hardin co., Tenn., on the Tennessee river, April 6-7, 1862. Gen. Grant, who was in command of the union forces, had about 32,000 men; and Gen. Albert Sidney Johnston, with about 50,000 confederates, marched up from Corinth and attacked on the morning of the 6th with his entire force, driving the federals toward the landing. Gens. W. T. Sherman and Prentiss suffered greatly in this attack, the latter losing three entire regiments. Gen. Johnston was killed by a rifle-ball on this the first day of the fight, and the command fell to Gen. Beauregard, who continued vigorously the attack, directing it mainly toward the center and left of the union army. This portion of the line of defense being protected by a heavy concentrated fire of artillery, and covered by two gun-boats in the river, the attack was repulsed, and the confederate line fell under such heavy fire at night that it was forced to retire. In the mean time Gen. Buell had come up with reinforcements to the extent of about 30,000 men, and these crossed the river during the night. The battle was reopened on the morning of the 7th by a heavy artillery fire from the union batteries, and on the confederates falling back, an assault was made and a general engagement ensued, which continued with great fierceness until late in the afternoon, when the confederates finally retired discomfited. The union loss was 1700 killed, 7,495 wounded, 3,022 prisoners; total, 12,217. Confederate loss: 1728 killed, 8,012 wounded, 959 missing; total, 10,699.

SHIMONOSEKI, a seaport town of Japan, at the extreme s. end of the province of Nagato (Choshu), commanding the narrow straits of the same name; lat. 33° 56' n., long. 131° e.; pop. '92, 33,592. It is the terminus of the great high road that traverses the entire main island, and the entrepôt of a bustling junk and steamer trade. It is surrounded by high hills. In 1185 the naval battle, in which 1200 war junks were engaged and the Taira army was annihilated by the Minamotos, was fought off the town. In 1863 the daimio of Choshu and his retainers erected forts on the bluffs, and refused to allow foreign vessels to pass through the straits—a place where they had no legal right to be, the laws of nations guaranteeing to every country the right to all its territory “to the distance of a marine league along all its coasts” (see Wheaton, *passim*). The strait of Shimonoseki at the narrowest portion is but half a mile wide. The mikado commanded the Choshu clan to close the strait. Foreign vessels were first warned off and then fired on. By the instigation of sir Rutherford Alcock, another expedition consisting of five British, four Dutch, and three French ships, with the small chartered steamer *Takiang*, having on board a gun and a party from the *Jamestown*, representing the United States, arrived Sept. 4 off the batteries, and began the bombardment on the 5th, continuing it for 3 days, when the silenced forts were entered and dismantled. The allied powers demanded from Japan an indemnity of \$3,000,000, of which \$750,000 was paid to the United States. The United States later returned its share to the Japanese government. On April 17, 1895, China and Japan concluded a treaty of peace at Shimonoseki, by the terms of which China acknowledged the independence of Corea, and gave to Japan the southern part of the province of Shingking, as well as the island of

Formosa and the Pescadores islands, opened a number of ports, and agreed to pay a war indemnity of about \$175,000,000.

SHIN, LOCH, in the s. of Sutherlandshire, measures 17 m. by 1 mile. The Shin water, a famous trout-stream, carries the waters of the loch into Oikell water. Loch Shin abounds in trout and salmon.

SHINDLER, MARY S. B. (PALMER), b. S. C., 1810; educated in northern seminaries; became a Unitarian and afterwards an Episcopalian. She published several volumes of poems and novels, among which were, *The Southern Harp*; *The Northern Harp*; *Charles Morton*, or *The Young Patriot*.

SHINER, the name of a small fish, the *stilbvis Americanus*; applied also to other species of the *cyprinidæ* family. The shiner is usually but 3 or 4 in. long, resembles the bream, is found abundantly in the United States, but is not edible.

SHING-KING, or LEAOTONG. See MANTCHURIA.

SHINGLES (probably derived from Lat. *cingulum*, a belt) is the popular name for the variety of *herpes* (q.v.) which is known as *H. zoster*.

SHINGLES, flat pieces of wood used in roofing like slates or tiles. Such roofs are much used in newly-settled countries where timber is plentiful. The wood is chosen from among the kinds which split readily and straightly, and is usually some kind of fir. It is cut into blocks, the longitudinal faces of which are of the size intended for the shingles, which are then regularly split off in thicknesses of about an quarter of an inch.

SHINNECOCK, a settlement of a remnant of the Shinnecock Indians abt. 100 in number, in Suffolk co., Long Island, N. Y., upon Shinnecock bay. The bay is a beautiful sheet of water about 10 m. long and from three to four wide, and is celebrated for its shell-fish. It is separated from the ocean by a narrow sand beach.

SHINPLASTER. During the American civil war it was found necessary for the Government to issue paper currency, owing to the scarcity of specie, which disappeared by being secreted or hoarded, and also in paying for imports. Small bills to the value of three, five, ten, twenty-five, and fifty cents were substituted for the coin of these denominations, and answered the purpose admirably, as they were widely circulated for several years. Comparatively few are still extant, and these are treasured as curiosities. See GREENBACKS.

SHINTOISM, or SINTUISM. See JAPAN.

SHIP (Ger. *Schiff* = *skiff*; from the root *skap-* or *skaph-*, to scoop, dig; Gr. *skaphe*, a trough, a boat) is a term applied with great vagueness to all large vessels; while under *shipping* would be included vessels of all sizes, excepting boats without decks. Among seamen, the expression is said to be limited to vessels carrying three masts, with a royal-mast surmounting each; but the development of steam-navigation, in which the largest vessels have sometimes only a schooner rig, must have gone far toward obliterating this distinction.

SHIP-BROKER—INSURANCE-BROKER. A ship-broker is a person employed in the buying and selling and freighting of ships. His duties include adjusting the terms of charter parties and bills of lading, settling with the master for his salary, collecting freights on goods brought into port, arranging with passengers for the terms of their passage, and generally managing all business transactions occurring between ship-owners and the shippers or consignees of goods. The charges made by ship-brokers are generally about two per cent on their gross receipts. Ship-brokers have been ruled not to be within the acts for the regulation and admission of brokers.

It is not customary in the U. S. for ship-brokers to unite with their business that of marine insurance brokerage. Particularly in the larger sea-ports these occupations become divided into narrower specialties. It is usual for a ship-broker to attend particularly to the buying, selling, and chartering of vessels, etc. The old practice of marine underwriting has given place almost entirely to insurance by stock companies, organized for and limiting themselves to the assumption of marine risks. Frequently, however, marine insurance companies divide their risks with similar companies by reinsurance and otherwise.

SHIP-BUILDING. See NAVIGATION; NAVIES, ANCIENT AND MODERN; NAVIES, MODERN. From crossing a river or lake on a floating log, or on two or more logs fastened together raft-wise, the first steps towards ship-building were probably canoes and currachs (q.v.). The earliest Egyptian drawings show boats constructed of sawn planks, and having sails as well as numerous oars. So far as can be learned from ancient sculptures, the galleys of the Mediterranean at the dawn of civilization appear to have been open, at least in the middle portion; to have been built with keel, ribs and planking, and to have been strengthened cross-wise by the numerous benches on which the rowers sat. Ships continued, however, to be generally of small draught, for they were beached every winter; and Cæsar mentions as a noteworthy circumstance, that some of the long ships with which he invaded Britain could only approach the shore to such a point that the soldiers in disembarking were breast-high in water. The Romans

built their vessels of pine, cedar, and other light woods; but their ships of war were of oak at the bows, clamped strongly with iron or brass, for use as rams—a custom now curiously revived after 2,000 years of disuse. According to Cæsar, the Veneti first built entirely of oak. The speedy oxidation of iron bolts and fastenings led to their supersession by copper and brass about the time of Nero. Before this time, the planks had been calked with flax, and the seams had been pitched. There is evidence to show that in Trajan's reign sheathing of lead fastened on with copper nails had been used as a protection for the timbers from the devastating insects of the Mediterranean. With the decline of Roman greatness came a new era for ship-building. The hardy Norsemen had chopping seas and Atlantic swells to fight with; their ships differed much from the stately galleys and quinqueremes of the empire. Far smaller, they were built more stoutly, with bluff bows, and a lug-sail which could be braced well up to the wind. The Norse ships must have been of considerable power, for there is good evidence that they had visited the coasts of the new world at an early period. We have, however, very little knowledge of the construction of these vessels, except that they had high prows and sterns to resist the waves, and that they were calculated for sailing in opposition to the galleys, which were for rowing. The introduction of galleys by Alfred, pulled by 40 and 60 oars, and twice as long, deep, nimble, and steady as the Danish ships, keep the latter in check; but it also checked the development of ocean-navigation, for the galleys were only fit for shore-service. The ships gradually increased in size. Hardicanute had a galley pulled by 80 oars; and contemporaneously, the Venetians are said to have built ships of 1200 to 2,000 tons. William invaded England in miserably small sailing vessels; but large—indeed very large—vessels appeared to have existed in the time of Richard I. John systematized ship-building by establishing a royal dock-yard at Portsmouth. Large ships constructed for sailing only seem to have come into general use, together with the mariner's compass, in the beginning of the 14th century. One hundred and fifty years later, the addition of the bowsprit added much to the sailing-powers of vessels.

In Ellis's collection of letters there is one, dated 1419 from John Alcêtre to king Henry V., concerning a ship building at Bayonne for that monarch. This letter is curious, as showing how many of the present terms then existed, and also that the "Kynges schyppes" were of considerable dimensions (e.g., "the stemme is in hithe 96 fete; and the post 48 fete; and kele ys yn leynthe 112 fete"). Before this period, ships had been built strong enough to encounter ice in the whale-fishery. From this period the history of ship-building is resolved into the history of individual parts, for the main principles of wooden ships were already established. In Henry VII.'s reign, the cumbersome fourth mast began to be dispensed with; in that of his successors, shifting top-masts came into fashion, the lofty stems and sterns (which must have precluded sailing on a wind) fell gradually into disuse. Port-holes were invented at least as early as 1500. In 1567, there were cutter-rigged vessels in the British seas. In the century ensuing, naval architecture was much improved by Mr. Phineas Pett, his son Peter, and by sir Anthony Deane; but the best naval architects were not in England. Within the present century, the introduction of steam has led to the building of ships with finer lines, both for bow and stern. About 1836, iron was introduced as a material for ship-building, and has now so far superseded wood, that, taking steamers and sailing ships together, 10 iron vessels are built for 1 wooden one.

Adverting now to the actual art and practice of ship-building, the subject is divisible into two distinct portions—the theoretical, known as *naval architecture*; and the practical, called *ship-building*. The naval architect designs the form of a ship with reference to the objects intended in her construction, to the speed required, powers of stowage, etc.; while the ship-builder works from his drawings, and gives practical effect to the theoretical designs.

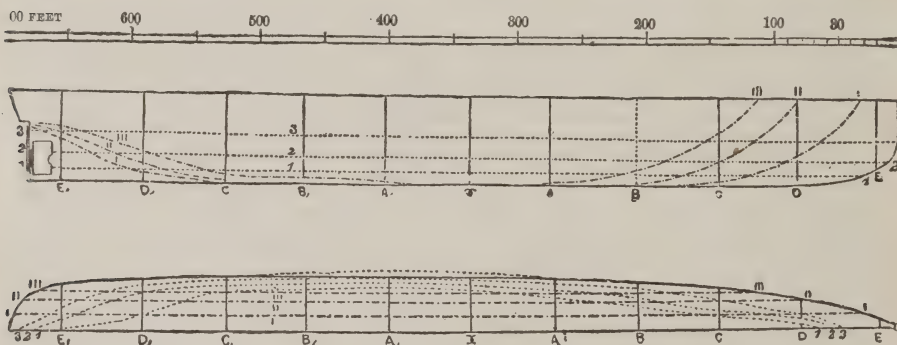
Naval architecture on a theoretic basis is of recent date, for, as in all cases, practical efforts, more or less in the dark, have preceded by many ages the theorems of the man of science; nor is it at present by any means an exact science: some most successful ships have been but happy experiments. Our present knowledge of naval architecture we owe mostly to the researches of such men as the late Prof. Rankine, Mr. Scott Russell, Mr. Froude, and others. All ships have to possess certain qualities, the principal of which are buoyancy, stability, handiness, and speed; but it is not possible for any ship to possess at the same time the maximum of all these, as to some extent they neutralize each other. The skill of the naval architect is shown in duly proportioning them to one another, ascertaining which are the more important in each particular case, and providing these without unduly impairing the others. In some vessels, it is essential that the greatest possible speed should be attained; while, as they are to work only in smooth water, their degree of stability (or freedom from excessive rolling, and tendency to right themselves when heeled over by a wave) is only secondary. In others, which have to weather long-continued storms in mid-ocean, speed may have to be sacrificed to attain greater steadiness. In sailing-vessels, where the means of propulsion is not under control of the crew as in steamers, handiness—the property of answering quickly to their helms, and of readily performing various maneuvers (such as tacking) under all conditions of weather—is often the quality to which most attention has to be paid. Along with all these things, the ship has to be made so as to have the largest possible amount of cargo

or passenger space consistent with the proper degree of buoyancy. The degree in which a ship possesses the various qualities named depends chiefly upon her external form and dimensions, about which the following general statements may be given:

An increase of length gives an increase of displacement of water, and therefore of carrying power; if this be not desired, it allows of finer lines forward and aft, and consequently greater speed. It also increases the resistance to lee-way. The greater friction of the water on the longer sides does not appear to be material. Against the increase is to be set a diminished power of turning, tacking, and wearing. It also involves a more careful balancing of weights in the fore and after portions of the ship, for the moment of inertia of a small weight may become large in a long vessel, from being such weight multiplied into the square of its distance from the ship's center of gravity.

The increase of breadth gives greater stability to the ship, and by allowing of more sail, indirectly greater speed; but directly, it increases the resistance to the water. Of course, greater breadth enables greater bulk to be carried. Depth is a question dependent on the seas to be navigated, the object for which the ship is intended, and many other reasons. It is to be borne always in mind that the consumption of stores on a long voyage will change the draught of a ship considerably. Practice has proved unequivocally that ships sail better for drawing more water aft than forward.

Passing now to the actual designing of vessels: the architect works on paper only; he has therefore to show on a flat surface, for the builder's guidance, the exact position, curvature, and relief of every line and point in his proposed structure. He accordingly draws three plans, on each of which every point of the ship is traceable; the *sheer-plan*, showing all lines of length and height; the *half-breadth plan*, lines of length and breadth; and the *body-plan*, which shows breadth and height. From these combinations, the exact position of every point is determinable. Figs. 1 to 3 show those plans, called *construction drawings*, on the same scale for the *Great Eastern* steamship. The *sheer-*



plan represents, in its outside line, a vertical plane through the keel. The dotted lines 1, 2, 3, are the edges of supposed horizontal planes drawn at various heights. The curved lines, I, II, III, are the edges, as they would appear on the outer covering of the ship, of vertical planes drawn parallel to the central plane through the keel. The uprights, A, B, etc., A₁, B₁, etc., are the edges of supposed planes drawn at given distances from the line of greatest breadth X, at right angles to the plane through the keel. The half-breadth plan represents one-half of the ship's upper deck, as regards the black outer line; the horizontal, vertical, and cross sections of the sheer-plan appearing again under different conditions. The vertical longitudinal sections become straight lines parallel to the keel; the horizontal sections appear as curves taken at different heights on the vessel's sides. The body-plan is the ship looked at end-on; the outer line being her cross section at the line of greatest breadth, and the horizontal and vertical sectional lines appearing at right angles to each other. The lines on the left side correspond to the cross sections of the after-body (that is, the portion of the ship nearer the stern than the line of greatest width), and the lines on the right side show the curvature up to the bow. Of course, in working-drawings from which ships are to be actually built, the scale employed would be very large; and instead of three or four sectional lines in each direction, a great number would be inserted for the guidance of the builder. With these three plans in hand, the workman has the exact position of every point in the ship's exterior coating exactly defined. Even the unprofessional observer need not strain his imagination greatly to clothe these flat plans with their dimensions of length, breadth, and depth, and to conjure up before his eyes the precise form of the goodly ship represented.

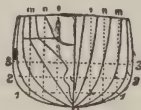
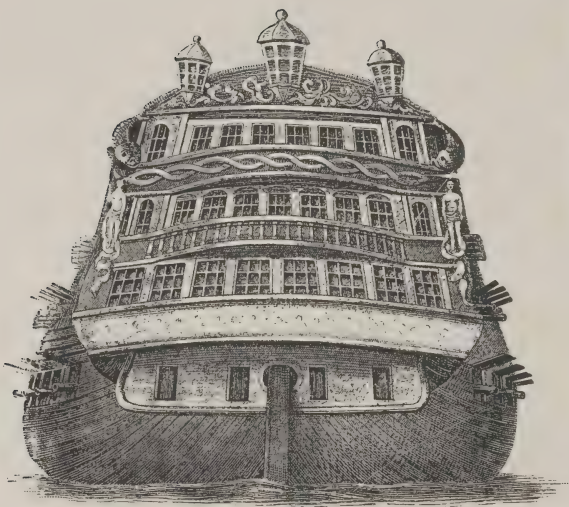
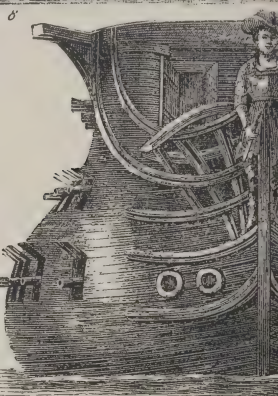


FIG. 3.—*Great Eastern*—Body-plan.

With the completion of the construction drawings the work of the naval architect



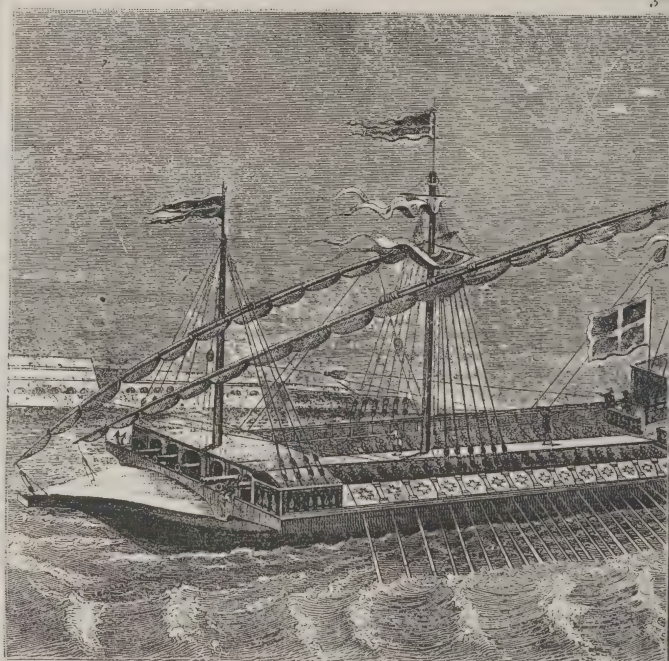
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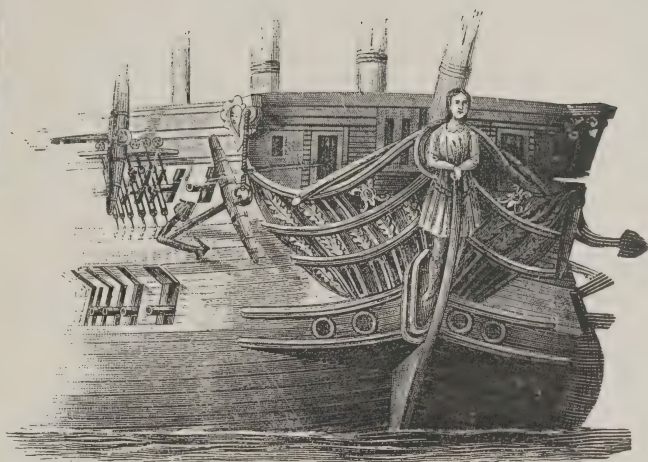
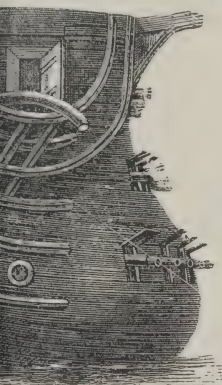


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7

SHIPS. ANCIENT.—1, 5. Stern and beak of English man-of-war (1758). 2. Prow of the *Invincible* (14th century). 6. Norman vessels (11th century). 7. English man-of-war (1801). 8. I



2



4



7

ble, French man-of-war (1747). 3. Venetian galley (16th century). 4. Merchant-ship
sian fleet in battle (1770).

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ceases, but in most cases the two professions of naval architect and ship-builder are combined in one firm, if not in one man. It is then to be decided of what material the ship shall be constructed. The choice lies between iron, steel, wood, and a combination of wood and iron. Of the many woods employed, oak, teak, and fir are those most commonly used. The building of a wooden and of an iron ship are quite distinct operations, the requisite strength being obtained in a different manner in each case. It is necessary, therefore, to consider separately the principles of wooden ship-building and iron ship building; and as the older and most time-honored process, we will first deal with the art of the ship-wright who forms the vessel of timber.

In addition to the construction drawings which we have described, it is usual also to construct a small wooden model of the ship—upon a scale very often of $\frac{1}{4}$ inch to the foot—which shows the designer what his ship is going to look like better than the flat paper can do. This model is made of a number of horizontal layers of wood, and upon it the whole arrangement of the plating of the ship is marked, with the position of all the joints, etc.

Wooden Ship-building.—The first process is to develop or “lay off,” on the *mold-loft floor*, certain full-size working sections of the required ship. These are taken from the construction drawings and the model, and are built up of planks. The combinations of these pieces of plank show the shape in which the several timbers will have to be cut, to impart the necessary curvature and strength.

The next step in actual construction is to prepare the slipway by raising a number of strong blocks of timber a short distance apart, on which the keel shall rest, and which shall sustain the entire ship when built. These blocks are composed of several pieces, and it is of the utmost importance that their upper surface be in an exact line. That line is made at an inclination of $\frac{1}{8}$ of an inch to a foot; and the keel of the ship, and the ship itself, have consequently that slope to the horizon while building. This inclination is for the facility it affords in launching the completed vessel. On the blocks is laid the keel, which may be called the backbone, and is certainly by far the most important timber in the ship. From it start the ribs, the stem, and the stern-post; so that any serious accident happening to the keel involves the breaking up of the whole structure. It is, therefore, made of great strength, being, in a first-rate, no less than 20 in. square. The material is usually elm, on account of its toughness, its non-liability to split, and the fact that immersion in sea-water preserves it. The pieces of which it is composed are united by the strongest kind of scarf joint (see CARPENTRY).

What the keel is to the bottom, the stem and the stern-post are to the bow and stern of the ship, forming the keys against which the “butts” and all longitudinal supports start. Each is, of necessity, of great strength, and they rise from the respective extremities of the keel. The *stern-post* has to bear the rudder, and is usually made, when possible, of one piece of timber; it is united to the keel by a mortise and tenon joint. In screw-steamers there is a second stern-post, forming the forward support for the screw.

The extreme outlines of the ship being now established, the builder proceeds with the timbers to form the bottom and sides, which together constitute the *frame*, corresponding to the ribs in an animal. The ribs form the sides of the ship, and are placed at from 2 ft. 6 in. to 3 ft. 9 in. from center to center. Up to the water-line the spaces between them are filled in solid with timbers of equal thickness. For this purpose in the midship-body the keel is crossed at right angles, or nearly so, by certain timbers which form the *floor*. The keel is let about three-fourths of an inch into a groove running along the bottom of the floor, while above the floor the *keelson* is a massive timber, parallel to the keel. The keel and keelson are bolted firmly together by long copper bolts,

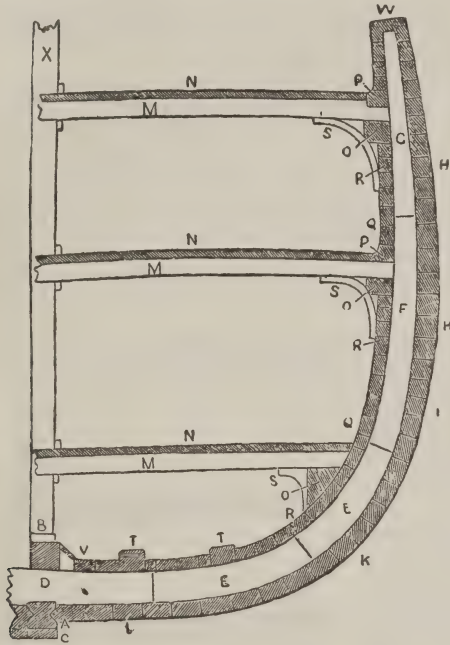


FIG. 4.—Ribs and Decks in section:

A, keel; B, keelson; C, false keel; D, floor; EE, fut-tocks; F, top-timber; G, lengthening piece; HH, wales; I, diminishing planks; K, bottom planks; L, garboard strakes; M, beam; N, deck; O, shelf; P, waterway; Q, spirketing; R, clamps; S, knees; T, side-keelsons; V, limber strakes; W, rough-tree rail; X, mast.

which pass through the timbers of the floor, and completely fix the latter. As an additional strengthening to the frame in large vessels, *side or sister keelsons* are bolted on to the floor or futtocks, a short distance on each side of the principal keelson. Fig. 4 is a cross section of a three-decked wooden vessel, showing a complete rib, with the principal parts as they are commonly arranged amidships. Near the ends of the ship the frames no longer stand at right angles to the keel, but are necessarily bent or canted round.

After the main skeleton, as it were, of the ship is built, the skin is the only thing remaining to complete its exterior. This is represented by thick wooden planking, fastened on to the ribs, the lowest layer pressing into the rabbet of the keel, and the highest reaching to the uppermost bulwark. The thickest planking is at the bends or wales, marked H in fig. 4, where it varies from 4½ in. in small vessels to 10 in. in ships of the first class. Every complete line of planking from stem to stern is styled a *strake*. Oak and fir are the woods mostly used for the skin, and elm for the planks nearest the keel. The planks are generally fastened to the ribs by copper bolts, but wooden treenails are frequently employed, as less in weight than copper, and less liable to split the wood. The comparative utility of wood and copper fastenings for the strakes is still a disputed point.

In a well-constructed ship the filling in of the timbers to a level above the water-line should be so accurately formed that she would float without her planking; but when the latter has been well calked, it is certain that it adds greatly to the dryness of the ship, while it aids materially in binding her several parts together.

At frequent intervals across the ship, and at the heights of the several decks, are inserted the *beams*, which are solid masses of timber, either in one piece or scarfed. These prevent the ship from collapsing, and at the same time support the decks. The beams and decks are shown at M and N respectively in Fig. 4. The beams are always made convex upward, principally for the sake of preventing water lodging on the decks. When the beams are well established, the hatchways and mast-holes are traced out. This done, the deck is laid down of straight-grained hard wood, and the planks are calked and pitched between, until the deck or platform becomes perfectly water-tight.

Along the inside of the bottom are laid the *sister keelsons* or *side keelsons*, if the ship be large, and all spaces are filled up with planking, except the width of one plank next the keelson on each side, which is left for a drain to carry all refuse-water to the foot of the pumps.

Iron Ship-building.—Iron affords, in many respects, a better material for ships than wood. In the first place, the same strength may be obtained with less weight; secondly, iron plates can be bent to any curve, so that the combinations necessary for strength in wooden vessels can be avoided. The laying off the lines of the vessel full size upon the mold-loft floor is the first process in iron as in wooden ship-building. Rough wooden templates are here made of the cross sections of the ship, one template to every cross section.

The slip-way is prepared in much the same way as in the case of a wooden ship. The keel is generally of flat bar-iron—sometimes in several thicknesses—the different lengths being scarfed at the ends and riveted together, or sometimes welded. In the cross section of a 2,000-ton iron vessel given in Fig. 5, the keel is in five thicknesses; in the middle a center-plate, which is carried upward through the floors, and forms a keelson; on either side of this a thick bar, and outside these again the two lowermost plates of the skin bent downward. The whole five thicknesses are riveted together.

The ribs in an iron ship are called “frames.” They are always made of angle-iron, and are placed from 18 in. to 2 ft. apart. They are bent, while red-hot, upon a large flat cast-iron plate, into the proper curve, fixed by the templates already mentioned. The frames, when thus bent to the right shape, are set up in place upon the keel. To them are fastened at the bottom the *floors*, which are narrow plates running across the ship; and frequently additional stiffness is gained by running “reverse” angle-irons along the top of the floors, throughout at least a considerable portion of the ship’s length. The beams which support the deck are convex upwards as in wooden ships. After the frames, floors, and beams are in place, the plating commences, each particular plate being of a size and shape exactly as determined by the model. The lowest plates of all are called the “garboard strake,”

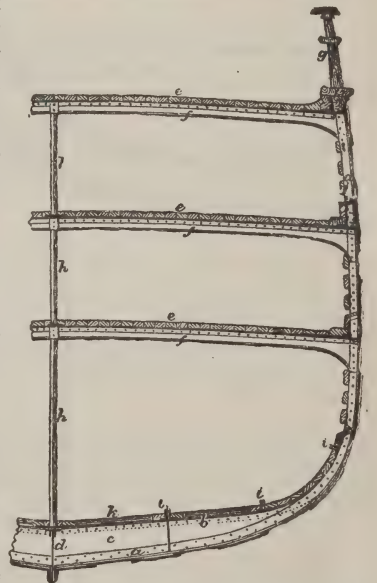
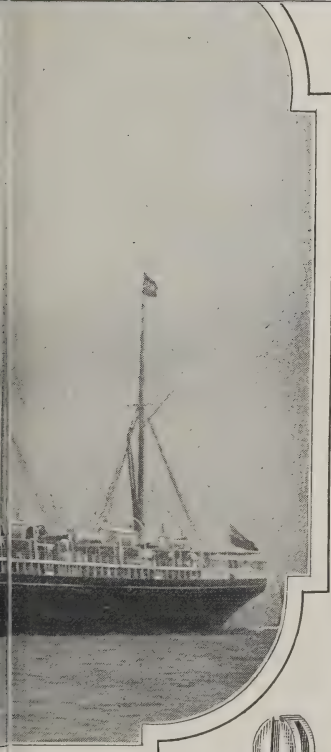
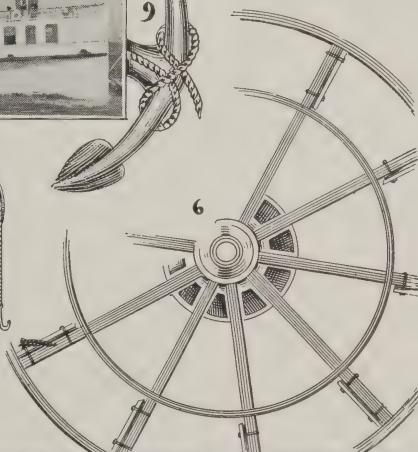
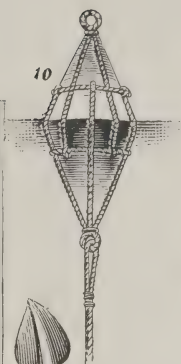


FIG. 5.—Section of Iron Ship:

a, frames; b, reverse angle-irons; c, floors; d, keelson plate; e, e, decks; f, f, deck beams; g, bulwarks; h, h, stanchions; i, i, bilge keelsons; k, ceiling.



SHIPS, MODERN.—1. The Long Island Sound Steamer "Puritan."—2. The American Line
6. Wheel of Steamer.—7. Manometer.—8. Indicator.—9, 10. Anchor and Gearing.



Steamer "Paris."—3. Twin Screw Steamboat "Monmouth."—4. The Yacht "Volunteer."—
11, 12, 13, 14. Parts of a Ship's Outfit or Gearing.

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and are usually bent downward and riveted to the sides of the keel, as in fig. 5. The thickness of the plates gradually diminishes upward, till the "sheer strake"—the strake at the level of the main deck—is reached, and this is always made very strong. The deck beams are further secured and stiffened by longitudinal and diagonal plates called "stringers." All the iron-work of a ship is fastened together by rivets. Holes are first punched or drilled in the plates and angle-irons—in most cases before they are put together. The holes having been made exactly to overlap, a red-hot rivet is inserted through them. A man, called a "holder-up," holds the head of the rivet forcibly in its place with an iron tool, while two riveters on the other side of the plate strike its end rapidly with their hammers until it is all hammered down. The contraction of the rivet when it cools causes it to hold the two plates still more tightly together. Iron ships are always divided into a number of compartments by transverse partitions called "bulkheads." These partitions can easily be made water-tight, and then afford great additional security to the vessel, as, in the event of a leak occurring, it will often be possible to confine the water to the space between two bulkheads, and there will be sufficient buoyancy in the other compartments to keep the vessel afloat. The bulkheads are fitted with water-tight doors, and besides being a source of safety, they are also the cause of great additional transverse strength.

By the time that the external plating of the ship is finished, and the beams and bulkheads all in their places, she is ready for launching; much, however, still remains to be done to her. Most frequently, the greater part of the decks has to be laid, and the whole of the cabin fittings to be put up; the rudder and steering gear have to be fitted; the wooden "ceiling" (which lines the hold) to be put in; the masts have to be set, and all the spars, sails, and rigging put up; and lastly, in a steam-vessel, the engines and boilers have to be placed and properly secured on the seatings provided for them.

Steel has till lately been little used in the construction of ships. As it possesses much greater strength than iron, all the various parts of a steel ship may be made much lighter for the same strains than in an iron one. There has been, however, a very widespread distrust of this material among ship-builders, based, to some extent justly, on the difficulty of getting really reliable steel plates and bars. But since 1880 the use of steel has been favored. In the United States there are great ship-building yards at Chester (Pa.), Philadelphia, Baltimore, San Francisco, and even on the lakes, as at Buffalo, that turn out iron and steel ships. In 1890, this country built ships having a total tonnage of 148,000 tons.

Ships of Iron and Wood conjointly, or "composite" vessels.—It was at one time thought that various advantages would be obtained by the use both of iron and of wood in the same ship, the frame and beams being made of the former material, and the skin of the latter. Composite vessels were always more used by the French than among ourselves, but although Lloyd's committee have thought this class of vessels of sufficient importance to publish special rules in reference to it, very few composite ships are now constructed.

In some modern ships of war, chiefly in the English navy, the vessels, after being built of iron in the usual way, and heavily armored, have been covered all over with planking, and copper-sheathed. The object of this has been to insure that the ship's bottom shall not be fouled with weeds and barnacles, which so easily happens with iron vessels, as these frigates are intended for very high speeds. See STEAM NAVIGATION.

Ships of Aluminium.—In December, 1893, the first vessel ever built of aluminium (a pleasure yacht) was launched at St. Denis, near Paris. Many ship-builders expect this light and now cheapening metal to enter largely into the naval construction of the future.

Internal Arrangements of a Ship.—Whether the vessel be of iron or wood, her internal design must follow the purposes for which she may be required. As a general principle, the ship is divided into a greater or less number of platforms, floors, or decks (q. v.), devoted to various purposes. In a ship-of-war a large portion is required for the men, the remainder being occupied by warlike stores, provisions, and coal. In a merchant-vessel far less space is allotted to the crew, and far more to the cargo. In every ship a space must be provided for the carriage of provisions and water proportionate to the number of the crew and the intended duration of voyages. A steamer differs from a sailing vessel in requiring a large compartment amidships to be kept clear for her engines and boilers. In screw-steamers, to the height of the boss of the screw above the keelson, a tunnel, known as the *screw-alley*, has to be kept open for the shaft of the screw from the engine-room to the stern. The heavier portion of a cargo, as coal and water, is carried immediately above the keel, so that the center of gravity may be as low as possible, and for the same reason the engines and boilers are placed as low down as practicable. For various details concerning the formation and arrangement of ships, the reader is referred to detached articles descriptive of the respective portions, as CABLE; CAPSTAN; DECK; HOLD; KEEL; MAST; MASTS; SAIL; SHEATHING, ETC.

Lloyd's.—In order that a ship may be insured by the underwriters, it has to be inspected and surveyed by one of the surveyors of "Lloyd's." According to the reports of their surveyors, the committee of Lloyd's registry classify the vessel, affixing to its name a letter which is intended to be as nearly as possible a correct indication of its real and intrinsic qualities. For wooden vessels, these letters (in order of excellence) are A (in black or red), Æ, E, and I; for iron ships or steamers they are A, A, and A.
A A A
A B C
 Numbers put before these letters indicate the number of years for which they are to

hold the grade indicated by the letter; and numbers (1 or 2) put after the letters refer to the completeness of their general equipment.

See Lindsay, *History of Merchant Shipping* (1883); Chadwick, *Ocean Steamships* (1891); and Reed, *Shipbuilding in Iron and Steel* (1890); Torr, *Ancient Ships* (1894).

SHIP CANAL, INTEROCEANIC. See INTEROCEANIC SHIP CANAL.

SHIPKA PASS, in Bulgaria, near the center of the Balkan mts.; 47 m. n.e. of Philipopolis, and 3 m. n. of the village of Shipka. Elevation, 4270 ft. It was made famous during the Russo-Turkish war, 1877. The pass fortified by the Russians was attacked by the Turks under Suleiman Pasha. For one week it was the scene of fearful conflicts, no less than ten attacks being made, in all of which the Turks were repulsed with great loss. 8000 Turks and 4000 Russians were reported to have fallen about the pass.

SHIP-MONEY, a tax had recourse to in England at various times, but especially in the reign of Charles I., for the equipment of a fleet. In 1607, when the country was threatened by the Danes, a law was made obliging all proprietors of 310 hides of land to equip a vessel for the protection of the coast. Elizabeth, at the time of the threatened Spanish invasion, required the various ports to fit out a certain number of ships at their own charge; and so great anxiety was shown by the public for the national defense, that London and some other ports furnished twice as many vessels as had been demanded. It was in 1626 that Charles first had recourse to an impost of this description, requiring each of the maritime towns, with the assistance of the neighboring counties, to arm a given number of vessels, 20 being required from London. In 1634 the tax was extended over the whole kingdom. A general spirit of resistance was immediately aroused, not so much in consideration of the amount of the tax, as of the objectionable feature, that it was imposed by the arbitrary authority of the king alone, which had come to be regarded as an unwarrantable stretch of the royal prerogative. In 1637 the celebrated John Hampden, a gentleman of property in Buckinghamshire, resolved to confront the power of the government by disputing the legality of this exercise of the prerogative, and resolutely refused payment of the impost, an example in which he was followed by nearly the whole county to which he belonged. He was prosecuted in the exchequer chamber for non-payment, and his trial was watched with great interest and anxiety by the nation on account of the constitutional point involved in it. The judges, four excepted, pronounced in favor of the crown; but the trial had the effect of thoroughly arousing the public mind to the danger of the imposition of taxes by the royal authority alone. The long parliament, shortly after its meeting in 1640, voted ship-money illegal, and the sheriffs and others who had been employed in assessing it or collecting it to be delinquents; and canceled the sentence against Hampden.

SHIPPEN, WILLIAM, 1736-1808; b. Philadelphia; graduated at Princeton college in 1754; studied medicine with his father, afterward at London and Edinburgh; returned to Philadelphia and lectured on anatomy in 1762; became professor of anatomy and surgery in the Philadelphia medical school in 1765; was in the medical department of the army in 1776, and its director-general in 1777-81.

SHIPPING, LAW or, treats of the ownership and employment of ships, the rights and obligations of their owners, masters, and seamen, and of the owners of their cargoes, and all contracts and torts arising from the employment of ships. By the U. S. statutes, the owners, masters, and officers of a vessel must be U. S. citizens to make it a U. S. vessel; it must be built in the United States, and must be duly registered or enrolled. Whenever it is sold, the bill of sale must recite the original certificate of enrollment or registry, or it cannot obtain a new registry. If the vessel is for foreign commerce, the necessary facts are presented on affidavit to the collector of the district, who issues a certificate of registry, which is evidence anywhere of the nationality and character of the vessel, whose name and that of its owners as well as its tonnage, where it belongs, etc., must be recited. If the vessel be less than 20 tons burden, only a license is necessary. If the vessel be over 20 tons burden and designed for fishing or the coasting trade, a certificate of enrollment issues in the same way in addition to a license. The rules of property in ships, unless modified by statute, are the same as those of other chattels. By statute, title to a U. S. vessel can be had only by building, by a judicial sale as a prize or for forfeiture, or by purchase and repair in this country at a cost of at least three-fourths its value, of a wrecked foreign vessel. By statute, also, every conveyance, mortgage, or bill of sale of any vessel or part of a vessel of the United States must be recorded in the office of the collector of the district where the vessel is registered or enrolled; otherwise such conveyance, etc., is valid only against the grantor, etc., his heirs and devisees, and persons having notice in fact. As to persons employed in navigating the ship, only the powers of the master need be considered here; the rights of the seamen, whose claim for wages takes precedence of all other liens upon the vessel, and is enforced in admiralty by a proceeding *in rem*, are protected by comprehensive statutory provisions. But the liability for wages is conditional upon earning freight on the voyage. The master has an absolute authority over the officers and crew, and in the navigation of the ship. He may bind the owners on all ordinary shipping contracts, which are usually executed in his name, and upon which suit may be brought by or against him personally. He may borrow money for repairs, hypothecate ship or cargo, and, in certain cases, even sell or abandon both. It is now held, however, that, before

resorting to any extraordinary step, he must, if within reach of the telegraph, get instruction from his principals. The rights and liabilities of owners of vessels are, unless limited by statute, identical with those of common carriers. See CARRIERS.

The regulation of shipping in the U. S. is solely under the jurisdiction of congress, and is purely a matter of statute law. By an act passed 1884, June 26, various changes were made in the law. It is provided that while, as before, all officers of vessels of the U. S. must be citizens of the U. S., an exception may be made when, on certain foreign voyages, there is a vacancy below the grade of master. Such a vacancy may be filled by an alien until the return to the home port. Where seamen are discharged on account of the unseaworthiness of the vessel when this results from negligence, they are entitled to a month's extra wages; and if the discharge take place in a foreign port, the master must pay the extra money to the U. S. consular officer at that port on behalf of the seaman. The provision to prohibit the payment of advance wages is made stronger in its terms, and a penalty is imposed upon any person paying such wages. There is a proviso, however, which permits such payments to a wife, mother, or other relative of the seaman. The act further limits the individual liability of the ship owner to the amount of his interest in the vessel; and the liability of all the owners is limited to the value of the vessel and freight. For the two principal shipping contracts, see BILL OF LADING and CHARTER PARTY. For the rules of navigation, see NAVIGATION, LAW AS TO. And for so much of the subject as is not treated here, see MERCHANT SHIPPING ACT, PART OWNERS, SHIP'S HUSBAND, DEMURRAGE, STOPPAGE IN TRANSITU, FREIGHT, AVERAGE, BOTTOMRY, RESPONDENTIA, SALVAGE, SEAMEN.

SHIP-RAILWAY. See INTEROCEANIC SHIP-RAILWAY.

SHIP'S HUSBAND, the maritime term for an agent appointed by the owners to attend to all matters connected with the outfit, repairs, and freighting of the ship. Under this capacity his powers have been held to be very large. He must see to it that the ship is seaworthy in all respects, has a proper crew and officers, is fully furnished with provisions, and has proper clearances and registry. He has power to enter into charter-parties (q.v.), and may settle freight-contracts, but has no power to insure the vessel nor to borrow money for her use; nor has he as ship's husband any lien on ship or proceeds. He is usually one of the part owners (q.v.), and his powers may be enlarged by acts of the owners.

SHIPTON, MOTHER, the dates of whose birth and death are currently, but on slight authority, given as 1488-1559, a so-called prophetess who lived at Winslow-cum-Shipton and Clifton, in Yorkshire, Eng., and attained her greatest cotemporary fame during the reign of Henry VIII. Conflicting accounts represent that her first name was Agatha, that it was Ursula, that she had no first name, and that her last name was derived from her husband Toby Shipton, from her father Solomon Shipton, and from her mother Ursula Shipton, a maiden lady who had an intrigue with the devil. But at all events, during her lifetime she seems to have been well known in her own locality and to have been constantly consulted by her neighbors; and after her death her reputation extended over the kingdom, being assisted in its growth by the frequent appearance of chapbooks or pamphlets purporting to be collections of her prophecies. Some of these may have been genuine but the larger number were from time to time invented and attributed to her. The latest edition of Mother Shipton's prophecies was published, 1862, by Charles Hindley who included in it some doggerel verses written by himself which, after describing a number of wonders that had happened, wound up with the declaration that the world would come to an end in 1881. In spite of his subsequent confession of the hoax the advent of that year was looked upon with much alarm by the superstitious in England and America. See Harrison, *Mother Shipton Investigated* (1881).

SHIP-WORM. See TEREDO.

SHIPWRECKS, in ancient times, were deemed the property of the crown, but by a statute of Henry I., the harsh consequences of this law were avoided whenever any person escaped alive out of the ship; and in Henry II.'s charter it was declared that if either man or beast escaped alive, the goods should remain to the owners if claimed within three months; and the courts of law still further refined away all these harsh rules. Many nice distinctions have been made as to what goods constitute wreck, which is distinct from goods floating. See FLOTSAM. By the well-known English shipping act, 1854, which extends to the United Kingdom, the board of trade has the superintendence of all matters relating to wreck, and to jetsam, flotsam, and ligan. Receivers of wreck are appointed for various districts, and have power to summon assistance. When wreck is found by any person, he must give notice to the receiver of wrecks, and if nobody claim the property within a year, it is sold, and the proceeds, after paying salvage and other such expenses, are paid into the exchequer.

SHIRAS, ALEXANDER EAKIN, 1812-75; b. Philadelphia; graduated at West Point, 1833; commissioned in the artillery; 1839-43, was professor at West Point. In the Mexican war he served in the commissary department, and was assistant to the commissary general, 1847-63. In 1874 he was made commissary general with rank of brig.gen. In 1865 he received the brevet ranks of brig. and maj.gen.

SHIRAZ, a celebrated city of Persia, and the capital of the province of Farsistan, in lat. $29^{\circ} 36' \text{ n.}$, long. $52^{\circ} 35' \text{ e.}$, was formerly a very flourishing city, and the ordinary residence of the Persian monarchs, but is now singularly divested of its ancient splendor. It is situated in a wide plain, on one of the limestone ledges which shoot out from the great west-Persian mountain system, 112 m. from the Persian gulf, and 35 s.w. of the ancient Persepolis (q.v.). It is inclosed by walls nearly 4 m. in circumference, and, previous to the great earthquakes which have repeatedly laid it in ruins, contained many splendid mosques, bazars, caravansaries, and other public buildings. The houses, which are mostly built of stone, are superior in appearance to those of most other Persian towns; and the adjoining portion of the plain is of exuberant fertility, and is laid out in vineyards and in rose-gardens of great extent. The principal manufactures are silk, cotton, and woolen goods, rose-water, glass, and inlaid goods. The wine of Shiraz, which is very strong and resembles Tokay, is still famous throughout the east. Rose-water is also still prepared in large quantities. The trade of the town is transacted in the *bazar-i Wukell*, which is about a quarter of a mile long by 40 ft. wide, and affords accommodation to several hundred shop-keepers. Shiraz carries on trade with Yezd, Ispahan, and Bushire, from the last of which towns it receives Indian and European goods. The city was founded in 697 A.D., and from its beautiful situation and charming climate became a favorite resort of the Persian princes; but a destructive earthquake in 1812 laid a large portion of it in ruins, and another in 1824, which cost the lives of 4,000 of the inhabitants, completed the wreck of its prosperity. It was, however, rebuilt, and had attained a pop. of 40,000 (its pop. previous to 1812 having been almost 60,000), when a third and more terrible visitation of this destructive agent, in April, 1853, laid almost the whole town again in ruins, and caused the death of 12,000 people. It has since been partially rebuilt in a somewhat inferior style, and its pop. is now estimated at 30,000. It is celebrated for the number and eminence of the scholars and poets to whom it has given birth; chief of these is Sibuyah, the first of Arab grammarians; Hafiz (q.v.), the "Anacreon" of Persia, whose tomb is half a mile n.e. of the Ispahan gate; and Sadi (q.v.), whose mausoleum is 22 m. to the n.e.—See *History of Persia*, by Clements Markham, 1874.

SHIRE, a river of south-eastern Africa, has its source in lake Nyassa, from which it issues in lat. $14^{\circ} 28' \text{ s.}$, and after a southerly course of 250 m., joins the Zambesi. It flows through a cotton and sugar producing country of vast extent, is 80 to 150 yds. broad, 12 ft. deep, and never varies more than 2 or 3 ft. from the wet to the dry season. Its current travels at the rate of 24 knots an hour. The navigation is obstructed by cataracts over a space of 35 m., in which it falls 1200 feet.

SHIRE (Sax. *sciran*, to divide), a term which seems to have originated in the 8th c., and is applied to the districts, otherwise called counties, into which Great Britain is divided. A considerable number of the counties of England, as Kent, Essex, Surrey, Norfolk, Suffolk, were formed out of the petty kingdoms of the Anglo-Saxons, which, with the advancing tide of centralization, were gradually becoming consolidated into one great kingdom. As early as 800, an entry in the Saxon chronicle relates that kings had ceased to reign among the *Hwiccas* (the inhabitants of the district afterward known as Worcestershire), and that they were governed by an ealdorman acting under Cynwulf, king of Mercia. This substitution of ealdormen (or earls) for kings marks the gradual organization of the counties. It was sometimes found convenient to split up a kingdom into several shires. The civil, military, and judicial head of the shire was the ealdorman, whose office was not necessarily hereditary, though it had sometimes a tendency to become so. Twice a year he held the shire-mote, in which he and the bishop presided with equal jurisdiction. Among other questions which would come before the shire-motes were those that related to the boundaries of the respective shires. As a border thane pushed his occupation toward the frontiers of the shire to which he belonged, and came into collision with the occupants of the neighboring shire, questions necessarily arose which could only be settled by a compromise arranged by the two shire-motes, and these compromises may account for the irregular jagged boundaries which separate shire from shire, and occasional isolation of particular portions. Yorkshire, Durham, Cheshire, and Worcestershire derived their name from their ancient bishoprics. Various shires which had once an existence in the n., as Northamptonshire, Islandshire, Hexhamshire, Hallamshire, Bamboroughshire, have merged into others. The term shire is nearly synonymous with county, yet not quite so, as there are certain counties with whose names the affix "shire" is never used. One explanation which has been given of this usage is, that the object of the addition of the syllable "shire" is to distinguish the county from the town of the same name, and that it is therefore only applicable to counties bearing the same name with their county town. Another explanation is that shire, being a word of Anglo-Saxon origin, is not properly applied to any of the English counties except those which formed part of the larger Anglo-Saxon kingdoms. Neither of these reasons is exactly correspondent with the actual usage by which shire terminates the names of all the English counties except the following: Northumberland, Cumberland, Westmoreland, Durham, Norfolk, Suffolk, Essex, Sussex, Middlesex, Kent, Surrey, and Cornwall. In Cheshire we drop the final syllable of the town of Chester. Berkshire, Shropshire, and Hampshire are never used in their simple form, though sometimes abbreviated into Berks, Salop, and Hants. Shire is applied to all the Welsh counties except Anglesea.

In Scotland, the English tendencies of the sovereigns from the time of Malcolm Can-

more to the war of succession, and the tide of immigration from the s., brought in, among other innovations, the division into shires. Its introduction seems to have begun early in the 12th century. Twenty-five shires or counties are enumerated in a public ordinance of date 1305. Nearly all the counties of Scotland may receive the terminal addition of shire. It is not applied to the island county of Orkney, and seldom to the counties of Bute and Caithness. Kirkcudbright is neither a shire nor a county, but a Stewartry. See STEWARTRY. The Irish counties are not generally called shires.

In England, s. of the Tees, there was a subdivision of the shires into *hundreds*, which originally, in theory at least, seem to have been districts inhabited by 100 or 120 families; and were in some localities called *wapentakes*, these hundreds or wapentakes being further subdivided into *tythings*, inhabited by ten free families; and it became incumbent on every one to be enrolled in a tything and hundred for the purposes of civil government. In some of the larger counties there was an intermediate division to which that into hundreds was subordinate. Yorkshire had and still has its *ridings* (q. v.), Kent had its *lathes*, and Sussex its *rapes*. The division into hundreds and tythings never penetrated into the four northern counties of England, or into Scotland, where the *ward* and *quarter* were the immediate subdivisions of the county.

England possessed three *counties palatine*—Cheshire, Lancashire, and Durham—of which the earls formerly possessed all the judicial and fiscal powers of the crown, all now annexed to the crown (see PALATINE).

SHIRLAW, WALTER, b. Paisley, Scotland, 1838; was brought to the U. S., 1840; studied for some years in Munich, Bavaria, but has spent most of his professional life in New York and Chicago. He was elected a member of the Chicago acad. of Design, 1868, and an associate of the National acad., New York, 1878, academician in 1888, and was made prof. in the Art Students' league. He was first pres. of the soc. of American artists. Among his paintings are, "Good Morning," "Sleep," "Toning of the Bell," and "Sheep-Shearing in the Bavarian Highlands."

SHIRLEY, a town in Piscataquis co., Me.; on the Boston and Albany railroad; 25 miles n.w. of Dover; settled 1825; incorporated, 1834; principal industry, lumbering, Pop. '90, 291.

SHIRLEY, a town in Middlesex co., Mass.: on the Fitchburg railroad; 40 miles n.w. of Boston. It was incorporated in 1753; contains the villages of Shirley, Wood's Village, and North Shirley; it has a high school, Hazen memorial library, saw, planing, and grist mills, and cordage, suspender, and basket works. Pop. '90, 1191.

SHIRLEY (SHERLEY), SIR ANTHONY, a distinguished traveler, navigator, and writer, was born in England in 1565. His first noted expedition was to the court of Shah Abbâs of Persia, who received him with much distinction, and sent him on an embassy to the different courts of Europe with the design of arranging an alliance with Persia against the aggressions of the Turks. He subsequently spent much time in Spain, and entered the Spanish naval service with the title of Admiral of the Levant Seas. He wrote a work entitled *A True Relation of the Voyage Undertaken by Sir Anthony Shirley, Knight, in 1596*, and a second narrative entitled *The Relation of Sir Anthony Shirley's Travels in Persia*. He died in Spain about 1630.

SHIRLEY, EVELYN PHILIP, an English antiquary, scholar, and genealogist was born in England in 1812 and died in 1882.

SHIRLEY, JAMES, 1596-1666; b. London; educated at Oxford and Cambridge, was curate at Hertfordshire, but soon resigned on account of becoming a Roman Catholic; opened a school at St. Albans, but, being unsuccessful, went to London, and became a dramatic writer. He founded a classical academy in London. His *Dramatic Works and Poems* were published in six volumes (1833), and include among other plays *The Lady of Pleasure*, *The Humorous Courtier*, *Bird in a Cage*, *Hyde Park*, *The Traitor*, and *St. Patrick for Ireland*.

SHIRLEY, ROBERT, brother of Sir Anthony Shirley, was born in 1570. He visited Persia with his brother and, like him, was employed in the service of the Shah Abbâs, both in the army and on several missions to the European states. He died in 1628.

SHIRLEY, THOMAS, eldest brother of Sir Anthony Shirley, and, like him, a traveler of distinction. He spent much time in Turkey, and published an account of his observations and adventures there. The date of his death is not known.

SHIRLEY, WILLIAM, 1693-1771; b. England; studied law and emigrated to Boston, 1734; was a commissioner to determine the boundary between Massachusetts and Rhode Island; governor of Massachusetts, 1741-45, and again in 1753, after a sojourn of eight years in England; commander-in-chief of the forces in British North America against the French, 1755; lieut. gen., 1759, afterward governor of the Bahama islands; returned to Massachusetts and built a residence at Roxbury in which he died. He wrote *Electra*, a tragedy, and a *Journal of the Siege of Louisburg*.

SHIS'DRA, or JISDRA, a t. of European Russia, in the government of Kaluga, and 82 m. s.w. from Kaluga, on the Shisdra, a branch of the Oka. It has a number of manufactures. Pop. '93, 13,248.

SHISHAK (in hieroglyphs, Shashank, the Susak or Susakim of the Septuagint, and the Shishak of the Hebrew version, the Sesonchosis or Sesonchis of Manetho), the name of several monarchs of the 23d, or Bubastite Egyptian dynasty, supposed to have descended from foreign settlers in Bubastis, and to have been of Shemitic origin. The kings of this name were Shishak I., the first monarch of the dynasty, whose name is found in the portico built by the Bubastite dynasty at the great temple of Karnak, and on several statues of the goddess Pasht, which probably came from Luxor. Jeroboam fled to Shishak from the pursuit of Solomon, who wished to kill him, and lived there during the lifetime of Solomon. On the death of this monarch, Jeroboam quitted Egypt, and contended with Rehoboam for the possession of the crown. This struggle caused the division of the kingdom of David into two states, that of Israel and Judah. In the fifth year of Rehoboam, Shishak marched to Jerusalem with an army of 12,000 chariots, 60,000 cavalry, and an innumerable number of infantry, composed of Troglodytes, Libyans, and Ethiopians. He took the city, the treasures of the temple, and all the gold bucklers which Solomon had made. The conquest of Jerusalem is found recorded on the monuments of Karnak, on which Shishak I. is represented dragging before the god Ammon three files of prisoners, inscribed with various names of places, among which are Judea, Mageddo, Ajalon, Mahanaim, and other towns taken by Shishak in his line of march.

SHITTIM-WOOD. It is not certain what kind of wood is meant by this name in the Old Testament. The ark of the covenant was made of it, and probably it was a kind of wood distinguished both for beauty and durability. It has generally been supposed to be the wood of the *acacia nilotica*, which, however, is deficient in both these qualities. Another supposition is, that the wood of a species of olive is meant, *olea similis*, which possesses them both, and is particularly remarkable for its durability.

SHIVES, a name used by cork-cutters to designate the small bungs used to close wide-mouthed bottles, in contradistinction to the phial-corks used for narrow-necked bottles.

SHO'A, a district of Abyssinia, in lat. 8° 30' to 10° or 11° n., long. 38° to 40° 30' east. Its boundaries, however, are by no means fixed, that on the w., where Shoa is bordered by the Galla tribes, being especially variable. An extensive tract in the e. of the kingdom, between the capital, Ankobar, and the river Hawash is called Efat. The character of the country, and the condition of the people, are described under Abyssinia (q.v.). The area is about 15,000 sq. m., and the population is estimated at 1,500,000.

SHOCK, COLLAPSE, AND REACTION. It is well known that some forms of injury, as, for example, a blow on the pit of the stomach, may occasion death without leaving any visible trace of their operation in the body; and, indeed, life may occasionally be destroyed even by sudden and powerful mental emotions. In such cases as these death is said to result from shock, the actual cause of death being the sudden arrest of the heart's action, consequent on the violent disturbance given to the nervous system. Instead of actual death, the condition known as *collapse* is more frequently induced, in which the patient lies in a state of utter prostration, and apparently on the verge of dissolution. The face, and even the lips, are pale and bloodless; the skin is cold and clammy, and drops of sweat are often seen on the forehead. The features are contracted, and there is great languor in the general expression. There is extreme muscular debility, and the sphincter muscles sometimes relax, so that there is involuntary discharge of the contents of the bowels and the bladder. The pulse is quick, and so feeble as often to be almost imperceptible, and the respiratory movements are short and weak, or panting and gasping. The patient is in some cases bewildered and incoherent, in others drowsy, and sometimes almost insensible. Nausea and vomiting, with hiccup, are not unfrequent symptoms; and in the case of children, convulsions are often present.

When a person recovers from a state of collapse, he passes into a condition termed *reaction*, which often lasts for several hours. The first symptoms of this favorable change are improvements in the state of the pulse and the respiratory actions, recovery of the power of swallowing, an increased temperature, and an inclination to move from the supine position to one side. A slight degree of feverishness then often ensues, after which the skin becomes moist, the patient falls asleep, and awakes convalescent. As a general rule, the longer the symptoms of reaction are delayed, the greater is the danger, and if several hours pass without any sign of the commencement of reaction, there is little hope of recovery. If the reaction is imperfectly developed, a condition may supervene which is known as "prostration with excitement," which may terminate either fatally or favorably, and into the symptoms of which our limited space will not allow us to enter further than to remark that a peculiar delirium, closely resembling *delirium tremens*, is most commonly present.

The principal causes of collapse (as given by Mr. Savory in his article "Collapse, and the General Effects of Shock upon the System," in Holmes's *System of Surgery*) are:

"Injuries sudden and severe, or extensive, as contused and lacerated wounds, involving a considerable amount of texture—the crushing of a limb, for instance. Burns present familiar and striking examples of extreme collapse, produced by this cause. Under this head, too, come capital operations. Injuries of very important organs, as the liver or other of the viscera, or of the joints, or other organs abundantly supplied with nerves. Pain alone, when intense and protracted, has proved fatal in this way; and it appears in

a case related by sir A. Cooper that sudden relief from great agony was attended by the same untoward result. Certain poisons operate in this manner, depressing the system so suddenly and severely as to produce a state of collapse; tobacco, for example; and drastic purgatives have in some cases induced a similar condition."

The effects of shock are aggravated by loss of blood; and hemorrhage alone, if sudden and profuse, will produce collapse. General debility and old age favor the influence of the shock, and much depends upon the idiosyncrasy of the patient; an injury which will produce no apparent effect on one man, often producing a serious and persistent impression on another.

The following are the most important points in regard to treatment: The patient should be kept in a horizontal position, with the head on the same level as the body, and he should not be raised till decided symptoms of reaction appear. The best stimulus is brandy, given in the form of hot brandy and water. "Its effects," says Mr. Savory, "are most certain and decided, and it suits the stomach best. It will remain when all other stimulants are rejected. The state of the circulation and the temperature are the guide to its use. If no effects are apparent after an ounce or two have been swallowed, it is very questionable if any advantage will be gained from a larger quantity." At the same time heat should be applied to the pit of the stomach and the extremities, by means of hot flannel, hot-water tins, or, in their absence, bottles containing hot water, and other appliances. Nourishment, in the form of beef tea, should closely follow the stimulants; the two may be combined with the greatest advantage, and as the system rallies, the latter may be entirely replaced by the former.

In those cases in which a patient is in a state of extreme collapse from an injury requiring a capital operation, such as the amputation of a limb, the operation should be performed as soon as his condition will admit of it; and although it should not be undertaken while the prostration is extreme, it is not necessary, or even advisable, in Mr. Savory's opinion, to wait for complete reaction; and this is the opinion of most of our best surgeons. Moreover, in these cases, the use of chloroform is not expedient; for, in the first place, it cannot be safely administered to a patient so depressed; and, secondly, the chief reason for its employment is wanting, for a person in a state of collapse is comparatively insensible to pain.

SHODDY formerly meant only the waste arising from the manufacture of wool; it now has a wider and much more important signification, and is almost wholly understood to mean the wool of woven fabrics reduced to the state in which it was before being spun and woven, and thus rendered available for remanufacture. Woolen rags, no matter how old and worn, are now a valuable commodity to the manufacturer; they are sorted into two special kinds, the rags of worsted goods and the rags of woolen goods, the former being made of *combing* or long-staple wools, and the latter of *carding* or short-staple wools. The former are those properly known as *shoddy-rags*, and the latter are called *mungo*. Both are treated in the same way; they are put into a machine called a *willey*, in which a cylinder covered with sharp hooks is revolving, and the rags are so torn by the hooks, that in a short time all traces of spinning and weaving are removed, and the material is again reduced to wool capable of being reworked. It was formerly used as a means of adulteration and cheapening woolen cloths, but it is now found of greater advantage in making a class of light cloths adapted to mild climates and other purposes.

The name is a purely technical one, which has arisen among the Yorkshire spinners, and is derived from *shed*, the term having been formerly applied by the operatives to the *flue* or waste shed thrown off in the process of spinning. During the civil war in the United States, it was discovered by the government, that some of the clothing furnished to the northern armies had been dishonestly made of shoddy, and as a term of reproach the term passed from military to civil circles, to be applied to parvenus whose social pretensions would not bear examination.

SHOEING OF HORSES. In olden times, horses generally went unshod, as they now do in many eastern countries; but our macadamized roads and paved streets, our fast paces and heavy loads, would speedily wear away the stoutest hoofs, and a rim of iron has accordingly been long in use as a protection. In style and pattern, the horse's shoe varies almost as much as his master's boot, and like it, when badly made, or unskillfully fitted, produces serious inconvenience, and even leads to accidents and diseases. When the feet are strong and properly managed, nothing is better than a plain shoe of tolerably uniform breadth and thickness, carefully fashioned to the shape of the foot. But many good authorities prefer what is called a seated shoe, which has a level part for the crust to rest upon, and within that the inner half of the shoe toward the sole surface is beveled off. This seated shoe is thus wider than the plain shoe, and hence affords greater protection for a weak or a flat sole. For faulty or diseased feet, special forms of shoes are suitable. In all healthy feet, the shoe should be fitted to the foot, and not, as is commonly done, the foot cut to fit the shoe. Another frequent error of keeping the shoe short and spare at the heels must be avoided. For roadsters the toe of the fore-shoes should be slightly turned up, which greatly obviates tripping. The hind-shoes are generally thickened, and sometimes turned down at the heels. The number of nails required must vary somewhat with the weight of the shoe and soundness of the horn; five is the minimum, nine the maximum. It is important, however, that the shoes be firmly held on by as few nails as possible. In a saddle-horse with

sound feet, three on the outside, and two on the inside, should suffice to hold a well-fitted shoe. Horses for heavy draught are generally shod in Scotland with tips and heels, which afford increased firmness of tread, and greater power, especially when dragging heavy loads. To preserve the foot in a sound state, the shoes should be removed every month. When the shoe is carefully taken off, the sole-surface on which it has rested should be rasped, to remove any ragged edges and any portions of adhering nails. Having for a month been protected from the wear to which the exposed portions of the foot are subjected, it will probably have grown considerably, and, in a stout hoof, will require to be cut down with a drawing-knife, especially toward the toe. Except in very strong feet, and in farm-horses working on soft land, the surface of the sole uncovered by the shoe seldom requires to be cut. It is the natural protection of the internal delicate parts, and must be preferable to the leather and pads often artificially substituted for it. The bars must likewise remain untouched, for they are of great service in supporting weight; while the tough, elastic frog must be scrupulously preserved from the destructive attacks of the knife, and allowed uninjured to fulfill its functions as an insensible pad, obviating concussion, and supporting weight. When the shoe is put on, and the nails well driven home, they should be broken off about an eighth or even sixteenth in. from the crust, and hammered well down into it. This obviously gives the shoe a much firmer hold than the usual practice of twisting off the projecting nail close to the crust, and afterward rasping down any asperities that still remain. When the shoe is firmly clinched, the rasp may be very lightly run round the lower margin of the crust, just where it meets the shoe, to smooth down any irregularities, but all further use of the rasp must be interdicted. The clinched nails, if touched, will only have their firm hold weakened; nor must the upper portions of the crust, which blacksmiths are so fond of turning out rasped and whitened, be thus senselessly deprived of those external unctuous structures, which render the unrasped foot so tough and sound, and so free from sandcracks. To prevent the hoof becoming too dry and hard, it is advisable, especially in roadsters, and in hot weather, to stop the feet several times a week with a mixture of equal weights of lard, tar, bees-wax, and honey, with about one-fourth part of glycerine, melted together, well stirred, and preserved in pots for use. Fuller details on this subject will be found in a little volume entitled *Notes on the Shoeing of Horses*, by Lieut.col. Fitzwygram, 15th (the king's) hussars; and in a paper on "Horse-shoeing," by Mr. Miles, published in the *Journal of the Royal Agricultural Society of England*, and reprinted in a separate form by Mr. Murray, Albemarle street, London.

SHOES—SHOE-TRADE. Clothing for the feet, whether in the form of sandals or shoes, has been in use in every country aspiring to civilization in ancient and modern times. The rudimentary shoe is a sandal consisting of a sole, held to the foot by straps and thongs. Such were the common Egyptian and Greek shoes, to which the shoes of the peasantry of the Abruzzi, in the s. of Italy, bear a close resemblance. In Egypt, however, the ordinary material for shoes were strips of the papyrus interwoven like a mat. As is seen from paintings on the walls of Thebes, shoe-making formed a distinct trade in the reign of Thothmes III., 1495 B.C., or about the period of the flight of the Israelites. The streets of Rome were encumbered with the stalls of shoe makers in the reign of Domitian. The shoe of the ancient Hebrews was a species of sandal. For ladies, the sandal, translated "shoe," in the Scriptures, was highly ornamental. "How beautiful are the feet with shoes, O prince's daughter" (Cant. vii. 1). Ornamented slippers are still a luxury in the east. The foot-coverings of the Romans were various in character, from the simple sandal and slipper to the boot, which extended up the leg. When the shoe covered the whole foot it was termed *calceus*; the calceus of a particular form and of great strength worn by the Roman soldier was known as *caliga*.

Reference is made in Scripture to different symbolical usages in connection with sandals or shoes. The delivery of a shoe was used as a testimony in transferring a possession: "A man plucked off his shoe, and gave it to his neighbor: and this was a testimony in Israel" (Ruth iv. 7). In cases of this kind, the throwing of a shoe on a property was a symbol of a new proprietorship or occupancy: "Over Edom will I cast my shoe" (Psalm lx. 8). From these ancient practices, in which the shoe was symbolical of contract, perhaps comes the curious old custom in England and Scotland of throwing old shoes for good luck after a bride and bridegroom on departing for their new home.

St. Crispin and his brother Crispinian have long been regarded as the patron saints of shoemakers. According to mediæval legend these personages were natives of Rome, and having become converts to Christianity, traveled into France and Britain to propagate the faith, everywhere supporting themselves by making shoes, which they sold to the poor at a very low price—one part of the legend being that an angel supplied them with leather. It is said that they suffered martyrdom in England toward the end of the 3d century. The memory of St. Crispin, of whom we chiefly hear, has, from time immemorial, been kept up by processions and other festivities in his honor on Oct. 25, which is known as "St. Crispin's day." Under this saintly tutelage, shoemaking has attained to the distinctive appellation of the "gentle craft," and is noted for the number of individuals who have risen from it to eminence. See an amusing but scarce work, *Crispin Anecdotes*; and a trade newspaper called *St. Crispin*. The sedentary and solitary nature of the craft, as hitherto conducted, has possibly had some influence in producing a degree of thoughtfulness, while the act of hammering his leather is calculated, as some

imagine, to stimulate the mental energy of the operative. If there be any real virtue in the sitting attitude of the shoemaker, a corresponding evil attends that method of carrying on his operations. In every profession, sitting at work in a close atmosphere is particularly injurious to health. Statistics assure us that out of 10,000 artisans who sit at their labor, 2,577 fall sick, and 95 die annually; while as regards an equal number of those who alternately sit and stand, only 1713 sicken and 61 die. To remedy this crying evil, a member of the profession, Mr. J. Sparks Hall, London, has invented a simple and inexpensive work-bench, at which shoes may be made standing. A few days practice, we are told, renders the workman as expert with the standing-bench as if he were seated according to the old plan, and he can execute closing with less fatigue and considerably more cleanliness. The only kinds of work at which sitting is more convenient are rounding the soles, lasting, and fitting. This standing-bench is, however, not much adopted by the men, who prefer old usages.

The fashion of shoes, as has occurred with other articles of dress, has undergone innumerable changes. At one time shoes were pointed to an extravagant degree; and in last century, the high heels of ladies' shoes became a monstrosity. Shortly after the beginning of the present century, the most marked improvement was the making of shoes right and left; the substitution of latches for buckles about the same period was also a step in advance. In our own day, the general disuse of the shoe proper, and the introduction of short ankle-boots, are the chief changes of fashion. A proposal for a more perfect adaptation of shoes and boots to the shape of the foot is noticed under Foot. The shoemaking trade, as at present conducted in Britain, is divided into two departments—the bespoke and the ready-made or sale business. The larger department hitherto has been that in which customers bespeak boots and shoes by having them made to measure; but it is generally giving way to the plan of buying articles ready-made. The cause of this is exceedingly obvious. The process of measuring is usually very imperfect, owing, among other reasons, to the want of lasts to suit every variety of feet, as well as the too general indifference to meet individual peculiarities. On this account, and even at the risk of purchasing an inferior class of goods, the public are becoming daily more disposed to encourage the ready-made trade. Accordingly large quantities of boots and shoes in innumerable varieties are now made and supplied wholesale by manufacturers for the retail dealers. Northampton, Stafford, and Leicester are considerable seats of this manufacture in England; and from certain districts in France, there are increasing exportations, chiefly of a cheap kind of ladies' shoes.

The plan of making boots and shoes by isolated workmen at their own homes has been found quite incompatible with the modern necessities of trade. As in the case of the hand-loom weaver, the shoemaker of the old school has had to succumb to machinery. After an unsuccessful struggle to oppose the introduction of sewing-machines, these are now coming generally into use, and men are employed in large numbers together in what may be called shoe-factories. Northampton and Stafford, the two chief of the centers just named, have unquestionably benefited by the introduction of the sewing-machine, although it deranged the relations between the masters and men for a time. An instructive and valuable exhibition of the leather and shoe trades was held at Northampton in 1873, illustrating the high pitch of excellence which these trades have now attained.

This manufacture has long been a staple trade of Massachusetts, in which state the quantity of boots and shoes fabricated annually is numbered by millions of pairs. An ingenious machine has been introduced into the American shoe trade for fixing the soles to the uppers by means of pegs, the inventor being a person in Salem, Mass. A pair of boots or shoes can be pegged in two minutes. These pegged goods are disposed of wholesale in boxes, and may be seen in retail stores all over the United States. As evidence of the important character of the shoe-trade in Massachusetts it may be mentioned that a few years ago there were as many as fifteen members of the "gentle craft" in the legislature of that state. Ingenious machines have also been introduced for fastening the soles to the uppers by means of fine screws. They were shown at the international exhibitions of 1862 and 1867 at work uncoiling lengths of wire, making the end into a screw, cutting off a small piece, piercing a hole in the sole, and screwing the wire therein.

There are no means of determining the extent of this trade in England or the United Kingdom.

The making of boots and shoes was one of the very earliest industries introduced into the American colonies, the town of Lynn, Mass., being noted for its practice from the time of the landing of its settlers. A letter from London, dated in 1629, refers to the sending of "hydes" on board the *Mayflower*, to two shoe-makers, who settled in Lynn. In 1855 there were 4,515 male, and 11,021 female operatives engaged in Lynn in the manufacture of shoes, producing to the value of \$4,000,000, this being prior to the introduction of the use of machinery in the trade. In 1890, with the machinery then in use, the number of employees were males 1,384 and females 607. With this reduction in the number of operatives, the production in 1890 reached \$19,474,500. [The displacement of human labor between 1865 and 1870 in the town of Lynn, by reason of the application of machinery, was 22 per cent in the case of the male, and 80 per cent in the case of the female operatives.] The value of the shoe manufacture in Massachusetts, Maine, and New Hampshire in 1890 was set down at \$138,709,245, that of New York city at \$18,979,259. In 1890, \$95,282,311 were invested in boot and shoe factory

industries in the U. S. There were 2,082 establishments employing 139,333 hands. The business of shoe-making was revolutionized in the ten years between 1861-71; the introduction of machinery which applied to every portion of the manufacture, having occurred within that period. The most important machines in use are the pegging machine; McKay sewing machine; Goodyear welt machine; cable-screw, wire, and wire-tacking machines, etc. The manufacture of shoes was for many years one of the principal employments of convicts in the state prisons, which were consequently made nearly self-supporting. Recently, however, the manufacture of shoes in prisons has been stopped in many states by statute. The principal shoe manufacturing towns in Massachusetts, after Lynn, are Haverhill, Marblehead, Worcester, Marlboro, Milford, Abington, North Abington and South Abington, the Bridgewaters, the Weymouths, Brocton, North Braintree, South Braintree, Brookfield, Medway, Beverly, Stoughton, Randolph, Quincy, and Danvers. In New Hampshire, Dover and Farmington are prominent, and in Maine, Portland, Auburn, and Lewiston. New York state is second to Massachusetts in the production of boots and shoes.

SHOLA, the white pith of the leguminous plant *æschynomene aspera*, a native of the East Indies. With this substance, which is exceedingly light, the natives of India make a great variety of useful articles, especially hats, which, being very light and cool, are in great request. Helmets made of shola are much used by the British troops in India.

SHOMER, JEBEL, a territory of central Arabia; pop. 450,000. It is a flat table-land, much of it desert with a few oases. On the e. border is a long valley called Wally Sirhan or Serhan, the common route for caravans to and from Syria. It contains the lake of Ittra, which supplies many of the adjacent provinces with salt. By means of artificial irrigation crops of grain, vegetables, and fruits are raised. A common article of export is ostrich feathers. There is considerable trade between Hayel and Medina. Horses, mules, and asses are exported. The capital is Hayel. It is in an extensive plain between Adja and Solma, inclosed by high mountains, and approached only by a narrow defile. Abdallah in 1818 made himself master of the whole district, and was succeeded by his son Telal in 1845, under whom it has become an independent sultanate.

SHOOTING STARS. See **AEROLITES**; **METEORS**.

SHORE. See **SEA-SHORE**.

SHORE, in ship-building, is a strong prop or stanchion placed under the bottom or against the side of a ship, to keep her steady on the slip or in dock. Shores are also used to support or prop up a building during alterations.

SHORE, JANE, 1445-1527; b. London; married a goldsmith of the name of William or Matthew Shore; mistress of king Edward IV., 1470, of lord Hastings, 1483. She received the offer of the hand of Thomas Lynom the king's solicitor, but Richard refused his consent. She was accused of witchcraft, and suspected of favoring the cause of the young princes. Openly charged with sorcery, by order of the duke of Gloucester, afterward king Richard III., she was committed to the Tower. Subsequently her property was confiscated, and she was sentenced by the bishop of London to do penance for her crimes. She lived until the accession of Henry VIII., and it is the popular belief that she died in penury and without a shelter.

SHORE, Rev. THOMAS TEIGNMOUTH, M.A., was born at Dublin, Ireland, in 1841; graduated at Trinity College in that city, with high honors in 1861, and subsequently acquired M. A. at Oxford. In 1865 he was ordained a clergyman; was successively curate of Chelsea and Kensington; then became incumbent of St. Mildred's See, and in 1873 was appointed incumbent of Berkeley Chapel, Mayfair. In 1878 he was appointed one of Queen Victoria's chaplains. He published *Some Difficulties of Belief*, and *The Life of the World to Come*; contributed to the New Testament Commentary of the Bishop of Gloucester and Bristol, and edited a series entitled *Helps to Belief*, writing the volume on "Prayer." He was made canon of Worcester in 1891.

SHOREDITCH is a district in London located in the borough of Hackney, which has always borne an immoral reputation. It was probably first named Soersditch after Sir John Soersditch, a lawyer who lived there in the time of Edward III. Tradition, however, is fond of ascribing its name to Jane Shore, a beautiful woman, wife of a prominent goldsmith of that vicinity, and who was greatly beloved by Edward IV. The two theatres of London during Shakespeare's time, were located in Shoreditch. They were looked upon as perfect centres of vice, and were much inveighed against by the writers of that time.

SHOREHAM, NEW, sea-port, and till 1885 a parl. borough of Sussex, on the left bank and at the mouth of the Adur, 6 m. w. of Brighton. The town arose when the harbor of Old Shoreham, now a m. inland, became silted up. Pop. of the parish '91, 3393. Ship building is carried on here on an extensive scale, and the trade of the port is considerable, principally with France and the coast. The harbor is not very good, being inaccessible at low tides. The parliamentary borough included the *Rape* (see **SUSSEX**) of Bramber, and had a pop., in 1881, of 42,442.

SHORT, CHARLES, LL.D., born Mass., 1821, graduated at Harvard college in 1842; assistant teacher in Phillips academy in 1847; master of the Roxbury classical school,

1847-53, and of a private classical school in Philadelphia, 1853-63; professor of mental and moral philosophy in Kenyon college, Ohio, and its president, 1863-67; succeeded Dr. Drisler as professor of Latin in Columbia college in 1868. His publications are *Advanced Latin Exercises* in Schmidt's and Zumpt's classical series; *New Ancient Geography*, revised; an essay on the *Order of Words in Greek*. He translated articles from the German for Herzog's *Real Encyclopædia*, and his contributions to the *Bibliotheca Sacra* and other reviews were numerous. He was one of the American committee of revisers of the English Bible. He d. 1886.

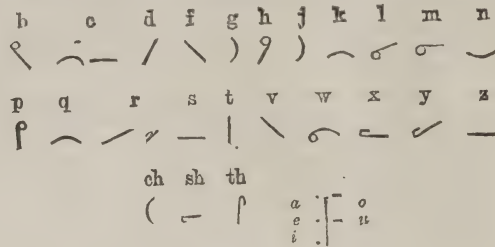
SHORT, WILLIAM, 1759-1849; b. Va.; educated at William and Mary college. In 1784 he was secretary of legation when Jefferson was minister to France. He was successively *chargé d'affaires* at Paris, minister at the Hague, and (1792-95) at Madrid. He was the first American citizen appointed to office under the constitution.

SHORTHAND (TACHYGRAPHY, BRACHYGRAPHY, STENOGRAPHY, PHONOGRAPHY).—The foregoing are names that have been applied to systemic brief writing, a large number of systems or descriptions of which have been invented and practised. Palæographers have expended much study on the subject of the invention and practice of the art among the ancients; the result of their investigations pretty conclusively establishing that the Romans were the first who produced anything to which the name, in the sense in which we now use it, can appropriately be applied. Dr. Zeibig, perhaps the most learned of living writers on the subject, claims (*Geschichte der Geschwindigkeitkunst*) that Kopp (*Palæographica Critica*) has proved that the Roman S. was not borrowed from the Greek; a view, however, still somewhat controverted. The Tironian notes, supposed to have been invented or perfected by Tiro, Cicero's freedman and amanuensis, was a system of abbreviated writing that was employed quite extensively while he lived, and still more so for several generations immediately succeeding. Evidently it was not employed with much success in the reporting of orations or addresses, however well adapted to dictation work. No ms. of Tironian notes supposed to have been written earlier than the 7th or 8th century has been found. Specimens still exist in various European libraries. In the 10th century knowledge of the Roman S. apparently disappeared. The Greek S., of specimens of which Kopp cites two, one in the Vatican library, the other at Paris, has also been the subject of research, but not with important results. Only a very remote relation between it and the Roman is traceable. Both systems employed abbreviated letters, apparently parts of the letters of the Greek and the Roman alphabet—in other words, *majuskeln*. A letter of John of Tilbury, an English monk, written *circa* 1174, indicates that he knew something of the Tironian notes. Bright's *Characterie* (1588), printed posthumously, was the first of a very long list of books and systems which the English mind has produced. Two S. bibliographies in English have been recently published: (1) Julius Ensign Rockwell's *Teaching, Practice, and Literature of Shorthand*, Circular of Information, U. S. Bureau of Education, 1884, the bibliography occupying 88 pp., with engraved reproduction of 88 alphabets; (2) Dr. J. Westby Gibson's *Bibliography of Shorthand*, pp. 246, 12mo (London and Bath, 1887). Reference is made to these; also to Dr. Zeibig's work, before mentioned, which contains an extensive bibliography, not limited to works in English. A translation (Heffley) of the historical part was printed by the New York State Stenographers' Association in their *Proceedings*, 1887. The *Transactions* (London, 1888, pp. about 500) of International Shorthand Congress, Sept., 1887, contain a mass of valuable information, historical, bibliographical, literary, and practical. The International Congress was nominally a tercentenary celebration of the publication of Bright's *Characterie*, 299 years before. The study of the subject in all its aspects and relations has recently greatly broadened.

John Willis, whose 8th ed. (1623) is referred to by Lewis in his *History of Shorthand* (1816), claims that his own art of stenography "was the first that ever gave direction for any form of spelling characterie." His alphabet and those of all known early English systems contained many compound characters or signs for the letters, disregarding the primary requisite of brief writing—the use of the fewest possible marks to represent the respective letters or elementary sounds. Though failing in this, Willis comprehended and applied the phonetic or "writing-by-sound" principle, now so almost universal in S. Mason (1672), Nicholas (1692), Weston (1729), Aulay Macaulay (1747), and Gurney (1750) exhibited various degrees of alphabetical simplicity. The development of Gurney's system, by himself and his successors, has been carried on with much intelligence and ingenuity; it is still the official system in the British parliament; has distinguished practitioners in different English law courts, and several among the legal writers in the U. S. Gurney employed, to a limited degree, what one of the latest of S. inventors calls the "vowel modes"—"taking off the pen and placing the next consonant in a particular [relative] position," to indicate intervening vowel sounds. This Lewis characterizes as "the worst of all methods," a statement which advocates of the Gurney system would dispute, and which writers of the modern Everett system (1877) would stoutly controvert. Byrom (1767) employed simple forms, beginning his signs for ten letters, however, with circles, a device often of advantage, as facilitating joinings. Blanchard (1779) presented an alphabet of simple forms; so also did Taylor (1786), whose alphabet is given below.

It should be said of Taylor's system, that it has been its fortune to undergo adaptation, by various hands, to the representing of several continental languages. Amanti, an

Italian, adapted it to his own language, which adaptation, as modified by Delpino, is now used by the official reportorial corps of the Italian chamber of deputies. In Spain, when Marti's system, the one most practised there, was first presented, it was avowedly as an adaptation of Taylor; so, also, the Guerra system. That of Marti has been much modi-

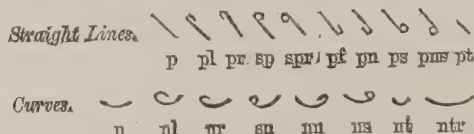


TAYLOR'S ALPHABET.

fied, and has been adapted to Portuguese. South American peoples speaking that tongue and the Spanish have made considerable use of S. In Mexico the proceedings of both legislative houses are reported stenographically. Adaptations of Taylor's system have been made to French, Dutch, Swedish, German, Roumanian, and Hungarian.

The development of the *phonetic* idea in connection with S. is traceable from John Willis (1602) through various systems. It reached a very complete expression in Nelson (*Parliamentary and Forensic Shorthand Writer*, 1836), who says, p. 22: "In spelling, you must be guided entirely by sound, and not by the orthography of the language in which you write." His system was that of Taylor somewhat modified. But Nelson could not completely carry out this theory; he could only represent the vowel sounds orthographically—e.g., t-h-o, *though*; t-h-a, *they*. Three years before, in 1833, had been published, at Preston, England, a work which its author, Thomas Towndrow, who had recently gone thither from America, called "a new and comprehensive system of representing the *elementary sounds* of the English language in stenographic characters." Towndrow presented signs for the *different sounds* of a, e, i, o, u, which signs were connectible strokes. When Mr. Pitman, a few years later, presented his system, now termed "phonography," he also gave an alphabet of *sounds* instead of letters. For his consonant signs he adopted simple strokes, straight and curved; for the vowel sounds, detached ticks and dots—necessary, however, to be omitted in brief writing, such omission being imperfectly provided for (imperfectly, because without approach to exactness) by writing the consonant strokes in various positions relatively to the line of writing.

This author has written and published a large number of instruction books of various grades, some of which have had sales to the extent of hundreds of thousands of copies. In England the author is the publisher of all instruction books in the system; he maintains his copyright strictly; hence, modifications of it, except such as he approves, are not published there. In the U. S., however, several series of text-books, containing more or less radical variations, have appeared—those of Benn Pitman, Graham, Munson, Osgoodby, Mrs. Burnz, Thornton, Longley, Scott-Browne (not to, at present, mention Bishop's *Exact Phonography*), being the most noteworthy. Among the expert professional parliamentary and law court S. writers in London, those who use the older systems of Gurney, Taylor, and Lewis rather outnumber, together, the disciples of Pitman; but in America nearly all such writers use some form or adaptation of the Pitman phonography. The number of schools in the U. S., and in the United Kingdom and its various colonies, in which this system is taught in some form, is very large. Something has been done in England, Scotland, and Ireland towards introducing it as a branch of higher common school education. It has recently been compelled to compete with the newer Everett and Sloan-Duployan systems, which, however inferior in the brief and easy representation of the *consonant* sounds, claim an advantage over it in their modes of vowel representation. The *consonant* part of the Pitman system embodies principles of abbreviation in great perfection, by its hooks, circles, and loops, all of two sizes, with halving and lengthening. The two engraved lines in part illustrate this:



In the U. S., in which S. is very extensively made use of, not only in the courts and in legislative bodies—in both of which the highest ability is required—but for amanuensis or clerical purposes, this system, in its various forms, has greatly the ascendancy. It is taught in many institutions, more particularly in commercial and business schools, and by teachers who devote themselves wholly to teaching it, by correspondence, in classes, or privately.

The distinguishing features of the principal American adaptations of the Isaac Pitman system may be briefly summarized. The *Graham* aims at greater brevity; it often gives shorter (and at the same time less markedly differentiated) word forms or grammalogues than does the original Pitman; it claims to abbreviate and phrase somewhat more systematically; it introduces an increased number of abbreviated forms that have to be well memorized. The criticism often made upon it is that it is the most difficult to learn; that its writers often, when practitioners, drop its more intense abbreviations, finding the use of them a burden to the memory and a hindrance to legibility. The *Munson*, adopting large and small initial hooks on curved strokes, in accordance with a device invented by Charles E. Wilbour, a former well-known New York city journalist and law stenographer, claims to have much simplified the arrangement of initial hooks, as compared with Graham, and rendered the art easier to be acquired. It contains, however, relatively more heavy or shaded strokes than the Graham. The *Benn Pitman* is very similar to what the works of Isaac Pitman have at times shown his own often-modified system to be, its *initial* hook arrangement being more like the Graham adaptation. The *Burns* quite closely resembles the Munson as to the hooks, but varies some diphthongal signs, and contains additional devices to show whether first indicated vowel sounds precede, or follow, those of initial consonant strokes. The *Longley* claims to be "eclectic;" appropriating and incorporating whatever the author thought best in all the others. It is a serious question whether such incorporations have always been judiciously or consistently made. The *Osgoodby* makes important changes in the signification of the *final* hooks, the advantage of which is far from generally conceded. The *Thornton* emphasizes the desirability of avoiding, where not absolutely necessary, all shading of strokes, i.e., it is, so far as practicable, a "light-line" system. The above are the most characteristic adaptations that retain the old vowel representation by detached signs and by "position."

In the U. S. it is said that in 1882 there were 276 educational institutions in which S. was taught, such teaching being mainly of the above-mentioned adaptations, and the Isaac Pitman (excepting the Osgoodby, which is more recent). A few use J. George Cross's *Eclectic* (an orthographic, not a phonographic, system), Takigraphy, the Scovill, the Gabelsberger, Pernin-Duployé, and two or three others less known. Similar statistics as to the United Kingdom and its colonies are not accessible. Of works on S. known to the Stenographic Institute, Dresden, the number, in 1883, was reported to have been 3295; Latin, 91; English, 780 (later report, 923)—370 of them Pitman, or modifications of that system; Welsh, 8; French, 490; Spanish, 71; Portuguese, 16; Italian, 151; Roumanian, 6; Slavonian, 3; Bohemian, 33; Russian, 52; Polish, 22; Slovenian, 3; Croatian, 7; Bulgarian, 4; Hungarian, 75; Finnish, 1; Danish, 7; Norwegian, 1; Swedish, 22; Greek, 3; Turkish, 1; Dutch, 14; German, 1434—684 relating to the one system of Gabelsberger, 482 to that of Stolze. Rockwell's bibliography or list, of systems and text-books in English alone, gives nearly 500. There are many S. societies and associations in these countries—many in the English speaking, including a considerable number in the U. S. Germany stands at the head, however, in this, having had, in 1887, about 1000, with a membership of 23,000—11,210 members writing Gabelsberger, 7798 Stolze, 1140 Arends, 1206 Roller. In Austria and Switzerland the number is very much smaller, but showing an aggregate, in both, of 94 societies, with nearly 2000 members.

In France several systems are in use, the modifications of Taylor by De Prépean—which has also been adapted to Latin by Bossuyt and to Dutch by Steger—apparently being the most generally used. Prevost, Senocq, and Duployé are also well-known names. The earliest known French stenographic author was Jacques Cossard (1651), a copy of whose work the writer of this article has examined.

In Germany the principal systems are the Gabelsberger, the Stolze, the Arends, and the Roller. The two first mentioned are far the most used. They are what are known as *script* systems—the strokes not being struck in all practicable directions, as are those of the English systems, but conformed, as far as possible, to the inclination or slant of the ordinary script—the strokes being much varied in length, variously shaded, and otherwise variously treated to secure the needed differentiation of form. Since the introduction of these systems, the growth of the art in Germany has been very rapid. It is a subject of lectures in, e.g., the University of Berlin.

The *Sloan-Duployan* system, now coming into use in England and somewhat in the U. S., is one of the new systems that aims at greater exactness. It seems to be a simple system to learn, and to attain, to a good degree, the object it aims at. A few of the angles and combinations seem to be too difficult of execution to be practicable for the most rapid work. The *Pernin* is also demanding recognition and receiving attention.

The *Everett* system (1877) is also one of the new ones, constructed with special reference to the attainment of exactness of vowel representation, as well as consonant. In addition to introducing a system of connectible vowel strokes, it introduces an elaborate system of vowel *indication*, called the "vowel modes," *implying* intervening vowel sounds, instead of writing the signs for them; doing this by varying the length of the preceding consonant stroke, or writing the succeeding one at different distances from, or touching or intersecting the preceding, or placing it in such relations to the beginning, the middle, or the end, of the preceding one. Its author claims for it great legibility;

the main question concerning it arises in connection with its disconnectedness, and as to whether it possesses sufficient brevity for rapid *verbatim* work.

The system of *Legible Shorthand*, the work of Mr. Edward Pocknell, London, also aims at securing a more certain vowel *indication* than the Pitman secures. Mr. Pocknell's strokes are of different lengths (and hence cannot be half- or double-lengthened), and are curved in different ways to secure particular indications. It apparently merely lessens, without entirely overcoming, the Pitman ambiguity as to vowel sounds.

The newest and perhaps most revolutionary work that has appeared is *Exact Phonography* (1887), by George R. Bishop, of New York City. He claims to have introduced a system of perfectly distinguished *vowel strokes*, and to have treated them in analogy with the well-known unambiguous Pitman treatment of the *consonant* strokes; that thereby a system of vowel representation, as exact as the consonant, is secured, the possibility of representing any vowel, as well as any consonant, sound with a similarly treatable connectible sign, also conducing to an equally rapid representation of the vowel sounds; that such treatment renders the writing of S. more a matter of constant application of well-known principles to easily manageable material, than of memorizing many semi-arbitrary forms; that this harmonization of vowel and consonant treatment greatly simplifies the science, renders it easier of acquisition, and more useful when acquired, because languages other than English can readily be phonetically represented by it; that by this extension of the consonant treatment to the vowel strokes, the necessity for an extra or additional mode of vowel representation, such as are the Pitman device of "position," the Everett of the "modes," is avoided. The system adopts, with a few changes, the Pitman consonant signs, and introduces a complete set of connectible strokes for both the vowel and the consonant sounds of ordinary speech.

In England, where modern S. was invented and first put to practical use, it was apparently first brought into requisition prominently in connection with legal proceedings; this long before it was used in parliament, and while a daily press was unknown. Its greatest use, for the producing of *verbatim* records, in that country, is still as incident to legal proceedings or quasi-legal—committee hearings, investigations, etc. In America it was quite early employed in reporting debates in congress, where it is still used in the making of elaborate and nearly *verbatim* records, a practice that also obtains in the legislatures of some of the individual states. But the largest field of practice that the thoroughly expert writers of S. find, in the U. S., is the legal; most of the states and territories having now, by legislation, provided for the appointment of official writers for rapid taking of testimony and judges' charges. In the courts of the various states, of both superior and inferior jurisdiction, the number of such official appointees must be two or three hundred. In the principal British colonies, probably the official *legal* reporting by stenographers exceeds in magnitude all other kinds—e.g., in Ontario, province of Quebec, other parts of British N. America, Australia, India, New Zealand. In the Dominion of Canada, the debates in parliament at Ottawa are carefully reported by men who are skilled and competent, provision being also made for reporting the few speeches that are made there in French. In continental countries there has been a much stronger relative tendency to utilize the art for legislative and assembly reporting. In France, Germany, Holland, Italy, Belgium, the Scandinavian countries, Bulgaria, this has been so, though in the last-named country some of the more important proceedings in the law courts are stenographically reported. In the German empire little progress seems to have been made in this direction.

SHORTHOUSE. JOSEPH HENRY, author, b. Birmingham, Eng., 1834; educated at private schools. He is author of *John Inglesant*, a remarkable historical romance (1881); *The Platonism of Wordsworth* (1881); an edition, with prefatory memoir, of George Herbert's *Temple* (1882); *The Little Schoolmaster Mark* (1883); *Sir Percival* (1886); *A Teacher of the Violin* (1888); *The Countess Eve* (1889); *Blanche, Lady Falaise* (1891).

SHORT-SIGHT. See SIGHT, DEFECTS OF.

SHOSHONE, a co. in n. Idaho, having the Bitter Root mountains for its e. and n. boundary, separating it from Montana; 4400 sq.m.; pop. 1890, 5382. Co. seat, Murray.

SHOSHONE, or SNAKE, RIVER. See IDAHO.

SHOSHONES, or SNAKES, a family of North American Indians, inhabiting the territory between the Sierra Nevada and the Rocky mountains, the s. part of Idaho, and the n. of Utah. They are divided into the Shoshones proper, the Utes, Comanches, and six other tribes. The Shoshones proper include the Bannacks. They came from the s., and gradually drifted towards the Rocky mountains. The Salt Lake Diggers were nearly exterminated in a battle on Bear river in 1862. In 1863 peace was made with most of the tribes, after years of open war, by Gen. Augur at fort Bridger. All but the Comanches, who have been settled in Indian territory, are on reservations, in Idaho, Wyoming, Nevada, and Utah.

SHOT is the term applied to all solid balls fired from any sort of firearms; those for cannon and carronades being of iron, those for small-arms, of lead. The latter are known as bullets and small-shot. The shot used for guns at present vary from the

3-pounder, for boat and mountain artillery, to the 13-in. shot, which weighs about 300 lbs. as a shell, or 700 lbs. as an elongated bolt. Generally, shot are cast. There are simple practical rules for calculating the weight of *spherical* shot from the diameter, and *vice versa*, which are often useful in reading of artillery actions. Given the diameter in inches, to find the weight in pounds: Cube the diameter, and multiply the result by 14; reject the two right-hand figures; those remaining give the weight in pounds.—Given the weight in pounds, to find the diameter in inches: Multiply the cube-root of the weight by 1.923, and the result is the diameter of the shot in inches.

Small-shot is of various sizes, from swan-shot, nearly as large as peas, to dust-shot. It is made by dropping molten lead through a colander in rapid motion from a considerable height into water. The lead falls in small globular drops. The holes in the colanders vary in size according to the denomination of the shot, No. 0 requiring holes $\frac{7}{16}$ in. in diameter, No. 9, $\frac{3}{32}$ inch. The colanders are iron hemispheres, 10 in. in diameter, and are coated within with the *cream* or scum which is taken off the molten metal. A small portion of arsenic is melted with the lead, and the fusion in the colanders is maintained by those vessels being surrounded by burning charcoal. The discovery of the advantage attending a long fall was made in England toward the end of last century. Previously the shot had dropped from the colanders at once into the water. The lead was then so soft that the shot were flattened by the water. The fall through the air enables the lead to cool and harden before taking its plunge. The smaller sizes require less fall than the larger—100 ft. suffices for sizes Nos. 4 to 9—the larger sorts demand 150 feet. The highest shot tower is at Villach, in Carinthia, where there is a fall of 249 feet. After cooling, shot is sifted in successive sieves to separate the sizes. Misshapen shot are found by their inability to roll; and finally, the whole are polished by rotary motion in small octagonal boxes, in which a little plumbago has been thrown. See also CASE-SHOT or CANISTER-SHOT, GRAPE SHOT, and BAR SHOT.

SHOTTS, a small and ancient village of Lanarkshire, close to the Kirk of Shotts, about 16 m. e. of Glasgow. About 3 m. to the s.e. of the Kirk, modern Shotts, or Shotts proper, began to rise at the close of the last century, when the Shotts Iron company erected their extensive iron-works there. Shotts may be said to consist of three villages—viz., Stane, Shotts Iron-works, and Dykehead, of which the united population in 1881 was 2,985. In the same year the population of the civil parish of Shotts was 11,214. Valuable coal and ironstone, peculiarly suited for the manufacture of iron abound in the district, and a large number of workmen are employed in iron-making and molding. Until recently there was no railway communication from and to Shotts for passengers; but since the opening of the Clelland and Midcaldor branch of the Caledonian railway, Shotts forms the half-way station between Edinburgh and Glasgow on that line.

SHOULDER-JOINT, **THE**, is a ball-and-socket joint. The bones entering into its composition are the humerus or arm-bone, and the scapula or shoulder-blade, the large globular head of the former being received into the shallow glenoid cavity of the latter, an arrangement by which extreme freedom of motion is obtained, while the apparent insecurity of the joint is guarded against by the strong ligaments and tendons which surround it, and above by the arched vault formed by the under surface of the acromion and coracoid processes. See **SCAPULA**. As in movable joints generally, the articular surfaces are covered with cartilage, and there is a synovial membrane which lines the interior of the joint. The most important connecting medium between the two bones is the capsular ligament, which is a fibrinous expansion embracing the margin of the glenoid cavity above, while it is prolonged upon the tuberosities of the humerus below. From its relations with the surrounding muscles, the ligament derives much of its strength. Accordingly, in paralysis of the arm, one or two fingers can often be pressed into the joint toward the head of the glenoid cavity, from which the head of the humerus is now separated.

The shoulder-joint exhibits the following varieties of motion: 1. Flexion, to a great extent; 2. Extension, in a much more limited degree; 3. Adduction, in an oblique direction, forward and inward; 4. Abduction, very freely; 5. Circumduction; and 6. Rotation slightly.

The morbid affections of the shoulder-joint may be divided into (1) those arising from disease, and (2) those dependent on an accident. The most common diseases are acute and chronic inflammation of the joint, which often terminate in its ankylosis or immobility. The principal accidents are fractures and dislocations. There may be fracture (1) of the acromion process, or (2) of the coracoid process, or (3) of the neck of the scapula, or (4) of the superior extremity of the humerus; or two or more of these accidents may be associated. Again, the head of the humerus may be dislocated from the glenoid cavity as the result of accident in three different directions—viz. (1) Downward and inward into the axilla, which is by far the most common form; (2) Forward and inward; and (3) Backward on the infra-spinous fossa, or the dorsum of the scapula. The first of these varieties is of such common occurrence that persons of ordinary intelligence should know how to recognize, and even (in an emergency) to treat it. The following are the most prominent symptoms: "The arm is lengthened; a hollow may be felt under the acromion, where the head of the bone ought to be; the shoulder seems flattened, the

elbow sticks out from the side, and cannot be made to touch the ribs; and the head of the bone can be felt if the limb be raised, although such an attempt causes great pain and weakness from the pressure exerted on the axillary plexus of nerves."—Druitt's *Surgeon's Vade-mecum*, 8th ed. p. 282. There are at least five methods of treating this form of dislocation. It is sufficient to notice two of them. 1. Reduction by the heel in the axilla. The patient lies on a couch, and the operator sits at the edge and puts his heel (the shoe or boot being previously removed) into the axilla, to press the head of the bone upward and outward, and at the same time pulls the limb downward by means of a towel fastened above the elbow. 2. Reduction by the knee in the axilla. The patient being seated in a chair, the surgeon places one of his knees in the axilla, resting his foot on the chair. He then puts one hand on the shoulder to fix the scapula, and with the other depresses the elbow over his knee.—For a description of the symptoms and mode of treatment of the other forms of dislocation, see any systematic treatise on surgery. See *illus.*, ANATOMY, vol. I.

SHOVELER, *Rhynchaspis*, a genus of ducks of the section having no lobe or pendent membrane on the hind toe, and remarkable for the expansion of the end of the mandibles in adult birds, particularly of the upper mandible. The lamellæ of the mandibles are long and very delicate. The legs are placed near the center of the body, so that these birds walk much more easily than many of the ducks. The common shoveler (*R. clypeata*) is smaller than the wild duck, but rather larger than the widgeon. The shoveler is a winter visitant of Britain, but not very common. A few remain all the year. It is widely distributed over Europe, Asia, and North America. Its flesh is very highly esteemed. A species of shoveler is found in Australia.

SHOW-BREAD. See SHEW-BREAD.

SHOWERS OF FISHES have occasionally fallen in different parts of the world, exciting great astonishment. Instances of this kind have occurred in Britain. A few years since, a shower of small three-spined stickle-backs fell near Merthyr-Tydvil in Wales, sprinkling the ground and house-tops over an area of at least several square miles. They were alive when they fell; yet if caught up by a whirlwind from any of the brackish ponds near the sea, in which this species of fish abounds, they must have been conveyed through the air a distance of almost thirty miles. Another similar instance occurred at Torrens, in the isle of Mull, in which herrings were found strewed on a hill five hundred yards from the sea, and 100 ft. above it.

Showers of fishes occur much more frequently in those tropical countries where violent storms, sudden gusts of wind, and whirlwinds are most common. In India, a shower of fishes varying from a pound and a half to three pounds in weight has been known to fall. Sometimes the fishes are living, more frequently they are dead, and sometimes dry or putrefying. They are always of kinds abundant in the sea or fresh waters of the neighborhood; and it cannot be doubted that they are carried up into the air by violent winds or whirlwinds; although they sometimes fall at a considerable distance from any water which could supply them. The sudden reappearance of freshwater fishes in ponds which have been dried up for months in tropical countries, is often popularly ascribed to their falling from the clouds; but the truth is, that they have been buried in the mud below, existing probably in a state analogous to that of animals in cold climates during hibernation. A pool, the bottom of which has long been dry, and on which grass has grown and cattle have walked, is again filled with fishes in a few hours after it is filled with water.

SHRAPNELL SHELL. See SHELLS.

SHREVE, HENRY MILLER, 1785-1854; b. N. J. Capt. Shreve was one of the first to engage in steam navigation in the west, and for nearly 40 years was connected with the river commerce of that section. He was the inventor of the steam "snag-boat," and for several years held the position of U. S. inspector of western river improvements. In the war of 1812 he had charge of various fortifications on the Mississippi, and in the battle of New Orleans did effective service as capt. of artillery.

SHREVEPORT, city and judicial seat of Caddo parish, La.; on the Red River and the Houston and Shreveport, the Queen and Crescent route, the St. Louis Southwestern, the Texarkana and Fort Smith, and the Texas and Pacific railroads; 326 miles n.w. of New Orleans. It is one of the most important interior cities of Louisiana, being in the midst of a great cotton-growing and stock-raising section, and besides its railroad advantages, having water communications of great value. There are a U. S. government building, high school, Thatcher institute, state charity and U. S. marine hospitals, cotton exchange, board of trade, national, state, and private banks, gas and electric lights, electric street railroads, improved sewerage, fine waterworks, and daily and weekly newspapers. The site of the city was given to Larkin Edwards by the Caddo Indians, who had been befriended by him, in 1835, and he sold it to a syndicate who obtained a city charter in 1839. For many years its principal interests were those connected with the cotton industry; but, while holding its own in this respect, it has become an important cattle, sheep, manufacturing, and general trade center. It has cotton compresses, cotton seed oil mills, cotton gins, manufactories of cotton machinery and ice, and an extensive trade in cotton, livestock, wool, and hides. Pop. '90, 11,979.

SHREW, *Sorex*, a genus of small quadrupeds of the family *soricidæ*. They are often popularly confounded with mice and rats, but are really very different, having insectivorous and not rodent teeth. The head is very long; the snout elongated, attenuated, and capable of being moved about; the eyes small; the tail long; both body and tail covered with fine short hair; the feet have a broad sole and 5 toes. The genus has recently been sub-divided, and the British species belong to more than one of the subdivisions. The COMMON SHREW of Britain (*S. or corsia vulgaris*) was, until recently, confounded with *S. araneus*, a species common in continental Europe. It is nearly $2\frac{1}{2}$ in. in length from the snout to the root of the tail, the length of which is about $1\frac{1}{2}$ inches. It abounds in dry fields, gardens, and hedge-banks; feeding chiefly on insects and worms, for which it grubs with its long snout among the roots of the herbage. It burrows, and makes long runs just under the surface of the ground. It is an excessively pugnacious little animal, and the males have fierce combats in spring, in which many are killed. Cats kill the shrew, but do not often eat it, probably on account of its strong musky smell; but it is the prey of weasels, hawks, owls, and shrikes. Harmless and inoffensive as it is, it has long been very generally regarded with dread and aversion by the vulgar. (See White's *Natural History of Selborne*.)—Another and even smaller species, *S. pygmaeus*, is found in Ireland, where it is called the shrew mole.—The WATER SHREW (*S. fodiens* or *crossopus fodiens*) is larger than the common shrew, being fully 3 in. long, and the tail 2 inches. It is of a blackish-brown color, gray or white on the underparts. It burrows in the banks of streams, and is very aquatic in its habits. It is found in many parts of Britain.—Some of the Indian species of shrew attain a much larger size, as that called the musk rat (q.v.). There is an Italian species which is the smallest of all known mammalia. It is only about $1\frac{1}{2}$ in. in length, exclusive of the tail, which measures about 1 inch. See illus., BATS, ETC., vol. II.

SHREW-MOLE, *Scalops*, a genus of insectivorous mammalia of the family *talpidæ*, and very nearly allied to the moles. There are 6 incisors, 2 canine teeth, 8 false molars, and 6 true molars in each jaw. The ear is destitute of auricle; the eyes are very small, and much concealed; the feet are 5-toed, the fore-feet large, as in the mole. The whole figure, and also the habits, resemble those of the mole.—There are several species, all natives of North America.

SHREWSBURY, a town in Monmouth co., N. J.; on the Shrewsbury river and branches of the Central of New Jersey railroad; 35 miles s. of New York. It was settled in 1664, and contains the ancient Anglican church with the crown of England on the vane, a public library, electric railroad, and a noted tomato catsup factory. Pop. '90, 8367.

SHREWSBURY, a parliamentary and municipal borough and market t., the capital of Shropshire, stands on the Severn, by which it is nearly surrounded, 163 m. n.n.w. of London by the London and Northwestern railway. It is irregular in plan, contains many inferior houses, partly built of timber, but often of very picturesque appearance. In the modern quarters the houses are handsome and regular. St. Mary's church was founded in the 10th century. There are a market house (1595), the shire hall (rebuilt 1883), and the new market hall (1868). The town contains interesting remains of the ancient walls, the castle, two monasteries, and a Benedictine abbey. The remains of the abbey church now form the church of Holy Cross. There are other ecclesiastical edifices, a free school, which is considered one of the seven great public schools of England; a number of other important schools, institutes, hospitals, etc. There are manufactures of agricultural implements and linen thread, iron foundries, and works for glass staining and malting. Shrewsbury returns one member to parliament. Pop. '91, 29,967.

Shrewsbury, called by the Welsh Pengwern, was named by the Anglo-Saxons *Scrobbes Byrig*, and of this the modern name is a corruption. The town connects itself intimately with the history of the country from the 12th to the 17th century. It was taken by Llewellyn the Great, Prince of North Wales, in 1215, during the disturbances between king John and the barons; and in 1403 Henry IV. here defeated the insurgent Percies and their allies with great slaughter. It was taken by the parliamentarians in 1645.

SHRIKE, or BUTCHER-BIRD, *Lanius*, a genus of birds of the family *laniadæ*, approaching more nearly in character to the *falconidæ* than any other of that family; having a short, thick, and compressed bill, the upper mandible curved, hooked at the tip, and furnished with a prominent tooth, the base of the bill beset with hairs, which point forward. The species are numerous, most of them natives of warm climates, although some occur in the more northern parts of the world. They prey on insects and small birds, and have a remarkable habit of impaling their prey on thorns; so that the nest of a shrike may be discovered by the numerous insects impaled in the neighborhood of it. Shrikes kill and impale many insects which they never eat, leaving them to dry in the sun; and in confinement they make use for this purpose of a nail, if provided with it, or stick portions of their food between the wires of the cage. They can imitate in some degree the notes of many birds, particularly those which are the utterance of distress, and they seem to make use of this power in order to attract birds within their reach. The most common British species, rarely seen, however, except in the s. of Eng-

land, is the **RED-BACKED SHRIKE** (*L. collaris*), a bird only about $7\frac{1}{2}$ in. in length, about a third of the length being formed by the tail, which is square at the end. Insects are the chief food of this bird, but it also preys on small birds, young frogs, and even young pheasants.—The **GREAT GRAY SHRIKE**, or **SENTINEL SHRIKE** (*L. excubitor*), is about the size of a thrush. It is a rare bird in Britain, but common in some parts of Europe, and is found also in Asia and North America. It was formerly used by falconers in catching hawks, of which it is greatly afraid, screaming loudly on their approach; the falconer waited in concealment, after fastening some pigeons and a shrike to the ground, until the scream of the shrike gave him notice to pull the string of his net.

SHRIMP, *Crangon*, a genus of crustaceans, of the order *decapoda*, suborder *macrouræ*, and family *crangonidae*, allied to lobsters, crayfish, and prawns. The form is elongated, tapering, and arched as if hunch-backed. The claws are not large, the fixed finger merely a small tooth, the movable finger hook-shaped. The beak is very short, affording a ready distinction from prawns. The whole structure is very delicate, almost translucent; and the colors are such that the creature may readily escape observation, whether resting on a sandy bottom or swimming through the water. The quick darting movements of shrimps, like short leaps, however, betray them to any one who looks attentively into a pool left by the retiring tide on a sandy shore. When alarmed, they bury themselves in the sand, by a peculiar movement of their fanlike tail fin.—The **COMMON SHRIMP** (*C. vulgaris*) is very abundant on the British coasts, and very generally elsewhere on those of Europe, wherever the shore is sandy. It is about 2 in. long, of a greenish-gray color, dotted with brown. It is in great esteem as an article of food, and is generally taken by nets in the form of a wide-mouthed bag, stretched by means of a short cross-beam at the end of a pole, and pushed along by the shrimper wading to the knees. Sometimes a net of larger size is dragged along by two boats. The supply of the market with shrimps affords employment to a great number of people.—The other species of shrimp seem to be equally fit for the table. Several are occasionally taken on the British coasts, but belong rather to more southern climates. See illus., **CRUSTACEANS, ETC.**, vol. IV.

SHROPSHIRE, or **SALOP**, a frontier county in the w. of England, bounded on the w. by north Wales, and on the e. by the counties of Stafford and Worcester. Area, 1343 sq. m.; pop. '91, 236,339. The Severn, the principal river, enters the county from Montgomeryshire, about 12 m. w. of Shrewsbury. It pursues a generally s.e. course of 70 m. across the county, is navigable throughout, and is joined by two considerable tributaries, the Tern and Teme. To the n. and n.e. of the Severn, the county is generally level, and is under tillage; to the s. and s.e., it is hilly and mountainous in the Cleve hills, rising to an altitude of 1800 ft., and here cattle-breeding is extensively carried on. A breed of horned sheep is peculiar to this county. The soil is generally fertile and well cultivated, though there are still extensive tracts of waste land. Shropshire is remarkable for its mineral wealth. The coal, iron, copper, and lead fields of Coalbrookdale, Snedshill, Ketly, etc., are very productive. Several thousand persons are employed in raising coal, iron, stone, and lime, and in the iron manufacture. The county returns four members to the house of commons. Capital, Shrewsbury.

SHROUDS are very strong ropes passing from the heads of the lower masts in a ship to the chains or channels on her sides, for the purpose of affording lateral support. They are crossed by thinner ropes, called ratlines, to form steps or ladders. The top-mast shrouds in ship rigged vessels are similar, except that they terminate in a row of dead-eyes on the outside of the tops.

SHROVETIDE (Anglo-Saxon *scrifan*, to shrive, to confess), literally means "confession-time," and is the name given to the days immediately preceding Ash-Wednesday, which, as indeed the whole period after Septuagesima Sunday appears to have been, were anciently days of preparation for the penitential time of Lent; the chief part of which preparation consisted in receiving the sacrament of penance, i.e., in "being shriven," or confessing. In the modern discipline of the Roman Catholic church a trace of this is still preserved, as, in many countries, the time of the confession, which precedes the paschal or Easter communion, commences from Shrovetide. These days were sometimes called fasting-tide or fast-mass, names which are still retained among the population in some parts of Great Britain. The name of Shrovetide was retained in England after the reformation, although the practice of "shriving," in which it had its origin, was abandoned. The precept of "shriving" having been fulfilled, the faithful, upon the eve of entering upon the Lent, were indulged with permission to give themselves up to amusements, and to festive celebrations, of which the counterpart is still seen in the continental carnival. In England the pastimes of foot-ball, cock-fighting, bull-baiting, etc., were, down to a late period, recognized usages of Shrovetide; and the festive banquets of the day are still represented by the pancakes and fritters from which Pancake Tuesday took its name, and by the "collops" which gave its title to Collop Monday. These usages are gradually disappearing.

SHRUB (see **SYRUP**), a kind of liqueur made chiefly in the West Indies. It consists of lime or lemon-juice and syrup, to which a small portion of rum is added; other flavoring materials are used occasionally.

SHRUBS are plants with woody stem and branches like trees, but of smaller size, not generally exceeding 20 ft. in height, and branching near the root, so as to have no main stem of considerable height. When a shrub is of small size and much branched, it is often called a *bush*. There is no more important botanical distinction between trees and shrubs, and the same genus very often includes species of both kinds. Many shrubs, as honeysuckle, are climbers.

In point of law, whoever plants a shrub thereby makes it a part of the soil, and it becomes a kind of fixture, incapable of being removed by tenants. But if the tenant is a nurseryman, who makes a business of planting and removing shrubs, it is otherwise.

SHUBRICK, WILLIAM BRANFORD, 1790-1874; b. S. C.; studied at Harvard, but left to enter the navy, 1806. He served in the war of 1812, on the *Hornet*, on the frigate *Constellation*, and on the *Constitution*, of which he became second in command in 1815. He was promoted commander in 1820, and capt. in 1831; was in command at the Norfolk, Va., navy-yard, 1840-43, and was appointed chief of the bureau of provisions in 1844. He commanded the Pacific squadron during the Mexican war, was made chairman of the bureau of construction in 1853, and commanded the Brazil squadron in 1858. Returning in 1859, he again became chairman of the light-house board, to which he had been appointed in 1852. He was made senior member of the advisory board, and rear-admiral in 1862.

SHUFELDT, ROBERT W., b. N. Y., 1822; entered the navy as midshipman, 1839. At the beginning of the civil war, he was a 1st lieutenant, but was then consul-gen. to Cuba; in 1862 he was made commander. He was prominent in the defenses of Charleston and had command of several ships. After the close of the war he was with the East Indian fleet, 1865-66; with that of the Mediterranean, 1871-73; in 1875 was made chief of the bureau of equipment and recruiting; rear admiral, 1883; retired 1884.

SHUGSHUT, a small t. of Turkey in Asia, in Anatolia, on the left bank of the Sakaria, 95 m. in direct line s.e. of Constantinople. On an adjacent hill is the tomb of Othman (q.v.), founder of the Ottoman dynasty. The tomb, resembling the handsomest and most ancient of the Turkish sepulchers at Constantinople, stands amid a grove of cypresses and evergreen oaks. Pop. estimated at about 8,000.

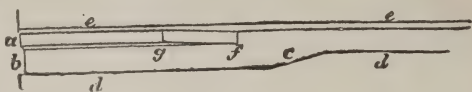
SHUMALA'RI or **CHUMALARI**. See **HIMÂLAYA**.

SHUMLA, a city of Bulgaria, about half-way along the line of railway which connects Rustchuk and Varna, and 50 m. w. of Varna. It is bounded on the n. and w. by mountains, and on the s. and e. by an undulating plain furrowed by valleys that extend n. to the Danube. Its situation is pleasing, and the character and distribution of its buildings give it a picturesque appearance. The roads from the former Turkish fortresses on the lower Danube and in the Dobrudscha on the n., and from the passes of the eastern Balkan on the s., converge upon Shumla, and from this reason it is an important strategic position. Under the Turkish sway, Shumla was one of their most important strongholds, with very strong and extensive fortifications, and possessed a citadel, arsenal, capacious magazines, large and numerous barracks, and a military hospital. The plain around was also studded with detached forts. In Shumla are nearly 40 mosques. Wine and silk are largely produced; there are manufactures of copper, cloth, and leather. The inhabitants during the Turkish supremacy were estimated at about 20,000, and were for the most part Turks or Mohammedans. Shumla was attacked in vain by the Russians in 1774, in 1810, and in 1828. The congress of Berlin, which established Bulgaria as an autonomous principality in 1878, resolved that the fortifications of Shumla and other Bulgarian towns should be destroyed. Pop. '93, 23,517.

SHUNT, a wire arranged to carry off a definite portion of an electric current—a by-path around an instrument. They are very much used in electrical engineering to protect a piece of apparatus from injury by being overcharged, to permit its removal for repairs, or to regulate the amount of current which passes through it.

SHUNT SYSTEM OF RIFLING is a very ingenious arrangement for securing the accurate centering of a projectile discharged from a rifled cannon. To obtain precision of aim and range, it is absolutely essential that the axis of a projectile should, at the moment of discharge, coincide exactly with the axis of the bore. This can scarcely be obtained unless the shot fits with extreme tightness into the gun; and if it does so, and the gun is a muzzle-loader, it is scarcely possible to load it. The ordinary principle has the projectile smaller than the bore, so as to pass readily into the gun, resting, of course, on the bottom of the bore. The projectile is covered with a soft metal, as lead, which expands with the pressure behind, and fits the shot tight into the grooves; but from the fact that it rested (at the commencement of the expansion) on the bottom of the bore, the axis of the shot is always below the axis of the bore. To obviate this, sir William Armstrong designed the "shunt" system, which in practice has been found admirably effective. In rifling the gun, the groove for 14 in. from the muzzle consists of a wide, deep indentation (*b* in figure), and at the side of it a narrow indentation of less depth, *a*; from 14 in. to 22 in. from the muzzle, this narrow groove gradually deepens, till it

attains the level of the broad groove, after which they run together for a short distance, until a shunt at *c* narrows the whole groove on the same side as *a* to the original width of *b*. Projecting from the shell is an iron flange too high to pass the narrow groove, and still higher by its side, a narrow band of zinc or of brass studs. Each of these passes freely along the broad deep groove of the bore. As the shot is rammed home, the twist of the rifling brings the iron flange against the edge *d* of the broad deep groove, which enables both the flange and zinc band to pass freely until past *f*, where the inclined plane ends. At *c*, however, where the groove becomes narrowed to only the width of the flange and band together, the shot is shunted over to the left. In this position it is rammed home. In coming out, of course, the pressure of the twist is reversed, and the zinc band presses against the straight edge *e*; on reaching *f*, the force of the exploded powder behind drives the shot on, while the inclined groove from *f* to *g* flattens down the zinc band, so that the projectile ceases to lie on the bottom of the bore, and is firmly centered by its several bands on the shallow grooves (whatever their number may be) round the bore's circumference. The lead fitting at the back of the shot has been meanwhile driven by the explosion into the deep wide grooves, so as to stop windage.



The Russians have a shunt system borrowed from sir W. Armstrong's, but differing in details. American guns, on similar principles, have been made experimentally. The invention does not appear to have been yet applied to small arms.

As the shunt system is complicated, it has been superseded by the Woolwich. See RIFLED ARMS.

SHURTLEFF, NATHANIEL BRADSTREET, 1810-74; born Boston, Mass.; son of Dr. Benjamin; graduate of Harvard university, 1831; of the medical school, 1834; commenced practice at Boston; mayor of Boston, 1868-70. He was learned in the sciences, an accurate genealogist, and a close and careful student of history. Notwithstanding that he claimed descent from 11 of the pilgrims of Plymouth, he was a devoted Roman Catholic. He was a contributor to the *Genealogical Register*, and edited the *Records of the Governor and Company of Massachusetts bay*, 1628-86, 6 vols.; and, with David Pulsifer, a publication from the MSS. of Nathaniel Morton, called the *Records of the Colony of New Plymouth*, 12 vols. He was author of several historical works.

SHUSHA, or SCHUSCHA, a fortified t. of Russian Transcaucasia, in the government of Elizabetpol, and 70 m. s.s.e. of Elizabetpol. It has manufactures of silk and cotton and there is some horse breeding. Pop. '91, 26,806.

SHUSTER, a city of Persia, in Khuzistan, on the Karun, 30 m. e.s.e. of Dizful, at the foot of a range of sandstone hills. In the early part of the present century, it was an important town and the capital of the province; but it was nearly depopulated by an epidemic in 1832, and was much damaged by an inundation in 1840. On a height stands the castle, commanded however, by a loftier elevation. The walls have been allowed to fall, and a fourth part of the town is in ruins. Customs are collected here, but the trade is not extensive. Pop. about 15,000.

SHUSHWAPS. See KOOTENAI.

SHUTE, SAMUEL, 1653-1742; b. London; educated at Leyden. He served under Marlborough in Flanders, and was governor of Massachusetts, 1716-23. During his term he had a dispute with the legislature, who refused to fix his salary and denied his right to negative the speaker.

SHUTTLE, the instrument used to carry the weft-thread in weaving. The original method of throwing the shuttle by the hand is still in use among weavers. The fly-shuttle, invented as early as 1733, is pointed at the ends with steel. The weft-bobbin is inserted in the center; and the necessary tension of the thread, is caused by two wire springs attached to this bobbin. The shuttle is made to allow the weft-bobbin to pass out at its side. The fly-shuttle is straight and is usually made of box-wood. The hand-thrown shuttles are occasionally carved, for convenience. See LOOM.

SIALOGOGUES are substances which, by local stimulating action, increase the secretion of saliva. Among the substances which thus act as direct stimulants to the salivary glands (q.v.), we may especially mention horse-radish root, mezereon bark, and pellitory root. Horse-radish root when chewed, produces a copious flow of saliva, and has been found useful in aiding deglutition in cases of paralysis of the tongue. If mezereon bark is used in the same way, the saliva should be frequently ejected, in consequence of the acrid properties which it absorbs from the drug. Pellitory root is the best of this class of remedies. Fragments weighing from half a dram to a dram may be frequently chewed when we wish to increase the flow of saliva in cases of facial neuralgia, rheumatism of the muscles of mastication, and paralysis of the tongue.

SIAM' (native name *Thái* = the free, or *Muang Thái* = the kingdom of the free), the chief state of Indo-China, is bounded on the s. by the gulf of Siam and the Malay peninsula. On the w., n., and e., the frontier-line is ill-defined and fluctuating, owing to many tribes being only partially under subjection, and to the constant wars of aggrandizement between Siam and the Malayan and Burmese races on the w., and the Cambodian and Cochinchinese races on the east. According to a recent account, the country lies in lat. 4° to 21° n., long. 98° to 106° e.; is 1200 m. in length, and about 350 m. in extreme breadth. Area estimated at 300,000 sq. m., including 60,000 sq. m. in the Malay peninsula; population estimated at 8,000,000. But the French have acquired a large part of the territory included in this estimate. Great Britain had transferred a considerable territory on Upper Mekong to China, but, in 1895, the Chinese government gave the French the right to this region, and, in 1896, the British government recognized the French claim, but entered into an arrangement with France guaranteeing to Siam the integrity of the lands in the basins of the Menam, Mekong, Bangpakong, and Pechaburi rivers, together with certain other districts. The territory taken by the French between the years 1893 and 1896, covers about 100,000 sq. miles, leaving to Siam only about 200,000. The population of these reduced limits of Siam is estimated at 5,000,000. The capital, and the only city of great importance to foreigners, is Bangkok (q. v.). The kingdom consists of 41 provinces, each governed by a phraya, or functionary of the highest rank.

Surface, Hydrography, Coast-line, Soil, and Climate.—The mountains which cover the northern districts of the country, and form natural barriers along its e. and w. frontiers, are branches of the great system of the Himalaya. Though the northern dependencies of Siam are mountainous, the kingdom proper is a vast plain, which only becomes hilly on its northern frontier. The great river of the country, the Nile of Siam, is called by foreigners Menam, or more commonly Meinam; but the Siamese call all rivers by this name, and distinguish the river by adding to the name Menam the name of the chief town or village on its banks; thus Menam Bangkok is the river of Bangkok, that is, the great river of the country, which Europeans and other foreigners have agreed to call Meinam. This river, the great life-sustaining artery of the country, rises among the mountains of the Chinese province of Yunnan, whence it flows s., and after a course of more than 800 m. in this direction, throws itself by three mouths, which are from 6 to 8 fathoms deep, into the gulf of Siam, about 30 m. (18 m. in direct line) below Bangkok. It receives a number of important affluents, notably the river Phitsalok, which joins it in lat. about $17^{\circ} 35'$ n. The annual inundation of the Meinam, the occasional non-occurrence of which entails failure on a great portion of the rice crops, commences in June and ends in November. Impregnated with the rich soil which it brings from the interior, its waters in August overflow the banks to a height sometime exceeding 6 ft. above the ordinary level. The tract of country within the direct influence of the inundations is estimated at 12,000 sq. m.; but, properly speaking, the actual valley of the Meinam, commencing 450 m. above the mouth of that river, and with an average breadth of 50 m., has an area of upward of 22,000 sq. m., and forms a tract of country the fertility of which is not exceeded in any other quarter of the globe. Of the other great rivers, the chief is the Mei-kong, which flows through the eastern districts of the empire, and is said to be 1600 m. long. The coast-line fringing the edge of the gulf of Siam may be roughly estimated at 1100 m., exclusive of minor windings. The breadth of the Malayan peninsula, in lat. 11° n., is only 50 m., and here two streams, the one flowing w. to the bay of Bengal, and the other e. to the gulf of Siam, offer great facilities for the construction of a ship-canal, for, their sources being near each other, a few miles of canalization are all that would be required to connect them, and thus form a sea-way across the peninsula, which would shorten the voyage between India and eastern Asia by many days, and often by weeks.—The climate of Siam is, for a tropical region, salubrious; the resident missionaries speak highly in its favor. The mean temperature at Bangkok for a series of eight years was 81.14° ; the maximum heat within the same space was 97° , and the minimum 54° . The warmest month was April and the coldest December. Hurricanes and typhoons are almost unknown in Siam, though it is visited every year by the s.w. and n.e. monsoons—the former bringing clouds, thunder-storms, and rain, the latter bringing refreshing weather.

Agriculture, Flora, and Fauna.—Rice and sugar are the principal crops. Of the other products, the chief are *agula*, or eagle-wood, renowned for its perfume, and extensively used on that account at funerals, marriages, and other ceremonies in Eastern Asia; gutta-percha, cardamoms, gamboge, bamboo, the rattan, valuable palms, the guava, mango; daurien, esteemed the king of fruits in Siam; the mangosteen, and many other fruits and other trees, including teak and a variety of valuable ship and house timbers. Among the animals, the most famous is the elephant, which abounds in the forests. It is against the law of Siam to kill elephants, as these animals are considered the property of the king; but many of them are nevertheless slain for the sake of their tusks. A variety of this animal, said to be peculiar to Siam, is the white elephant, which is not really white, but of a light mahogany color. This animal is held in the highest veneration, the cause of which is that he is "supposed to be the incarnation of some future Buddha, and will therefore bring blessings on the country which possesses so great a treasure."

He is fed upon fresh grass, and sugar-canes and plantains, served in rich dishes, is covered with ornaments, inhabits a building attached to the palace, enjoys the rank of nobility, and is tended by a staff of officers, guards, valets, etc. Tigers abound, especially in the Laos country in the n.; tiger-cats, rhinoceroses, boars, wild pigs, elks, and deer of many kinds, tenant the woods. Crocodiles, lizards, and serpents of various kinds are numerous. Excellent fish are found on the coasts and in the rivers. Great improvements have been made in Siam in recent years by extending the system of irrigating canals. Siam is eminently a country of water-ways and the great rivers are connected by numerous canals, which fulfil the double office of irrigating the land and affording means of communication.

Minerals.—Gold is found among the mountains, and silver in combination with other metals; copper, tin, lead, and iron are abundant, and are extensively worked by the Chinese. Precious stones are found in great number and variety.

Manufactures.—Vases, urns, and other vessels, in the manufacture of which gold is embossed upon silver, are made here in great numbers, and have an oriental celebrity. Gold-beating, iron-founding, and manufactures of fine cloth, glass wares, and pottery are carried on.

Commerce, Exports, and Imports.—The trade is in the hands of the foreigners, the British having the greatest share. The center of foreign commerce is Bangkok, which is a cosmopolitan city containing large numbers of Europeans and foreign Asiatics. Next to the British, the Germans enjoy the largest share of the Siamese trade, and there are some Danish, Dutch, Italian, and French houses in Bangkok. Of the Asiatics, the Chinese are the most active in commerce in Siam. The natives are unenterprising and leave to the foreigners, especially to the Chinese, a large share even of the petty retail trades. The means of living are easily secured and hard work seems unnecessary. The Siamese treat foreigners with respect, and afford no obstacles either to travel in the interior or to trade. The duties on foreign merchandise are low, not exceeding an average of 3%. Bangkok is connected by regular steamship lines with Hong Kong and Singapore, and in passing from the Pacific coast of the United States to Siam but one change is required, at Hong Kong. The country is a member of the International Postal Union. There are large banking agencies in Bangkok, with representatives in the leading European and American cities. The chief article of export is rice, which made up 66% of the total in 1894. Most of it found a market in Hong Kong and Singapore. Next in importance is teak-wood, purchased for shipbuilding and largely consumed in Great Britain. Other exports are various kinds of gums, seeds, animal products and minerals. Of the imports, the most important class of articles is textile fabrics, but there is a considerable importation of food products, including sugar, wines, liquors, tea, molasses, and flour. Kerosene oil, hardware, crockery, jewelry and paper have also been important articles of import. As to the condition of labor, the natives are liable to forced labor during a certain portion of each year. Domestic slavery was formerly general, but has gradually been abolished. Slavery for debt is still practiced. There is a dearth of free labor, and dependence is placed in some parts of the country chiefly on the Chinese coolies, and in others on the Burmese, Karens and Khamus. A railway connecting Bangkok with the seaport Paknam was opened in 1893 and a survey for a line from the former city to the northern and eastern provinces was begun in 1888. In 1896 a railway from Bangkok to Korat, a distance of 165 miles, was in process of construction. The mileage of telegraph lines has also increased in recent years.

Inhabitants and Government.—The Siamese proper, that is, the Thai race, form about a third of the entire population. "They are gentle, timid, careless, and almost passionless." They differ in several respects from many eastern nations. Lying, though frequently resorted to as a protection against injustice and oppression, is not a national characteristic. The Siamese are inclined to be idle, inconstant, and exacting; but they are sincere, very affectionate in their domestic relations, witty in conversation, and, like the Chinese, expert in mimicry. The population of the entire region comprised within Siam before the French annexation was estimated to contain 2,500,000 Siamese, 2,000,000 Laotians, 1,000,000 Chinese, 1,000,000 Malays, and about 1,500,000 Burmese, Indians and Cambodians, but the estimates of the population are unreliable. Their diversity is illustrated by the reports in regard to Bangkok, whose population, according to estimates, ranges anywhere from 200,000 to 1,000,000. The Laos people (see SHAN STATES) are also very numerous in the country, and there are considerable numbers of Malays and Cambodians. The religion of the Siamese is Buddhism (q.v.), which inculcates the highest veneration for life in whatever form. A Siamese will not kill vermin or serpents; and the tameness of many creatures that in Europe flee from the presence of man is observed by all strangers. The use of betel (q.v.) is almost universal in Siam. All the belles of Siam stain their teeth black. The Siamese are extremely ceremonious in their intercourse one with another. An inferior crouches and crawls on the ground before a dignitary, and speaks of himself as "your slave—a hair—a little beast." They are a small well-proportioned race, with olive-colored skin, and black hair, of which all that they allow to grow is a tuft about two inches long on the top of the head, the rest being shaven off. They are remarkably fond of jewelry and ornaments, and the dresses of the higher functionaries and nobles are splendid and beautiful. They are fond of music; have a number of good native instruments, as well as the common European ones, and are skillful performers.

The government is an absolute and hereditary monarchy, although the hereditary principle is not necessarily observed, each king having the right of nominating his successor. There is a cabinet consisting of departments of foreign affairs, interior, justice, finance, public instruction, public works, war, marine, etc. By royal decree in 1895 a legislative council was created, whose object is to revise and perfect the legislation of the kingdom. In case of any temporary disability on the part of the crown, the legislative council has power to promulgate laws. In the same year the administration of the country was consolidated under a single head, Prince Damrong, minister of the interior, having it in charge. The portfolios are held by the king's half-brothers.

History.—The annals of the Siamese begin about five centuries B.C. But nothing authentic is known of the history of the country till 1350, in which year Ayuthia, the former capital, was founded. Cambodia was first conquered in 1532, and in this century the Siamese dominion extended to Singapore. The present dynasty ascended the throne in 1782. There have been Protestant and Roman Catholic missionaries in the country since 1828, and they are usually regarded with favor by the natives. King Khulalongkorn I., born in 1853, succeeded to the throne in 1868. He has been a progressive ruler, and during his time many material improvements have been effected. In 1897 he made an extended tour in Europe. See Maxwell Sommerville, *Siam* (1897).

SIAM, GULF OF, an important arm of the Pacific ocean, is bounded on the n. and w. by Siam, on the s.w. by the Malay peninsula, and on the n.e. by Cambodia. At its entrance between Cambodia point and the peninsula of Patani on the Malay peninsula, it is 235 m. wide, and from the line drawn between these two points it extends inland in a n.w. direction to the mouth of the Meinam, a distance of 470 miles. Four great rivers, navigable to a considerable distance from their mouths, and the chief of which is the Meinam (see SIAM), fall into the gulf. It is unvisited by hurricanes of any kind, and shipwrecks here are very rare.

SIAMESE TWINS, a name given to two youths, Eng and Chang, born of Chinese parents in Siam, in 1811, having their bodies united by a band of flesh, stretching from the end of one breast-bone to the same place in the opposite twin. The survival to advanced life of such a *lusus nature* makes this one of the most remarkable cases on record. A union of the bodies of twins by various parts is not an unusual occurrence (see MONSTROSITY). Ambrose Paré has depicted instances of union by the back, belly, and forehead. The last occurred in two girls, who lived to the age of ten years, when one of them dying, a separation was made; the wound of the living girl assumed a bad character, and soon proved fatal. The Hungarian sisters, who lived about a century since, were united by the back, had one passage from the intestines, and each had one from the urinary organs. They died when they were 22 years of age. The Siamese twins were purchased of their mother at Meklong, a city of Siam, and were brought to America by Capt. Coffin and Mr. Hunter in 1829. On examination, the connecting band seemed to have united them at first face to face, but constant traction had so changed its direction, that they stood partially side by side. Its length above was about two in.; below, nearly four; from above downward, it measured three in.; and its greatest thickness was one and a half inches. It was covered with skin, and when the center was touched, both felt it; but on touching either side of the median line, only the nearest individual was sensible of it. The connection between the Siamese twins presented many interesting points in regard to physiology and pathology, for although they formed two perfectly distinct beings, they appeared most frequently to think, act, and move as one individual.

After realizing a competence by the exhibition of themselves in the various countries of Europe, the Siamese twins settled in one of the southern states of America, where they were married to two sisters, and had offspring. Owing to domestic quarrels, however, two houses were found necessary, each living with his wife a week at a time alternately. Ruined by the civil war in America, the Siamese twins again made the tour of Europe and exhibited themselves to the public. They died in 1874, the one surviving the other an hour or two only.

For a full account of the structural peculiarities of such cases, see St. Hilaire's *Histoire des Anomalies de l'Organisation d'Homme et des Animaux*.

SIARA, properly, Ceara (q.v.).

SIBBALD, Sir ROBERT, an eminent Scottish naturalist, b. at Edinburgh, April 15, 1641, of a good family (the Sibbalds of Balgonie, in Fife), studied at the high-school and university of Edinburgh, and afterward pursued his medical studies at Leyden, Paris, and Angers; settled as a physician in Edinburgh in 1662, devoted much time to botany and zoology, and aided sir Andrew Balfour in establishing a botanic garden in Edinburgh. Having inherited an estate, he retired from medical practice, but continued his scientific pursuits; was appointed by Charles II. his majesty's geographer for Scotland, and was encouraged to prepare a work on the geography and natural history of his native country. His death is supposed to have taken place in 1712. He published many pamphlets on medical subjects, natural history, Scottish history, antiquities, etc. The work for which he is now chiefly remembered is his *Scotia Illustrata, sive Prodrromus Historiæ Naturalis*, etc. (fol. Edin. 1684), a work of great merit for its time, but his *Collection of Several Treatises in Folio Concerning Scotland, as It was of Old, and also in Later Times* (Edin. 1739), is not without value.

SIBERIA, a vast territory in northern Asia, belonging to Russia. In England the name is generally applied to all the Russian possessions in Asia, with the exception of the Transcaucasian and Armenian provinces. Siberia so defined is bounded on the n. by the Arctic ocean; on the e. by the seas of Kamchatka, Okhotsk, and Japan, all of them arms of the Pacific ocean; on the w. by the Ural mountains, Ural river, and Caspian sea. The southern boundary is made to include the recent Russian acquisitions in Turkestan, runs from lake Issyk Kul, n.n.e., then eastward by Kiahta to the Argun river, which it follows to the Amur; the latter it follows to long. 135° e., where it trends in a s.s.w. direction, ascending the Ussuri tributary for 200 m., and then runs straight to the sea at the northern frontier of Corea. In the official language of Russia, however, Siberia is not of so wide extent. The Russian possessions in Turkestan form a separate division under the name of CENTRAL ASIA, and to this portion of the empire the governments of Akmollinsk, Semipalatinsk, Turgai, and Uralsk are now attached. Geographically speaking, these governments belong to Siberia; as do also considerable areas e. of the Ural mountains, which for administrative purposes, form part of the European governments of Perm and Orenburg. The following article deals mainly with the region officially termed Siberia; for the Russian possessions in the Turkestan territory, see ASIA, CENTRAL. The following are the subdivisions or governments of Siberia:

	DIVISIONS AND PROVINCES.	
	Surface in Eng. Sq. Miles.	Population 1892-94.
Yakutsk.....	1,533,397	245,368
Transbaikalia.....	236,868	611,686
Irkutsk.....	287,061	460,275
Yeneseisk.....	987,186	480,546
Tomsk.....	331,159	1,422,681
Tobolsk.....	539,659	1,411,475
Amur Region.....	888,830	242,004
Sakhalin.....	29,336	26,590
Total.....	4,833,496	4,874,335

According to the enumeration of 1897 (see RUSSIA) the population of the whole of Asiatic Russia, including the trans-Ural districts of Perm and Orenburg was 15,300,000. In Siberia there is about one inhabitant to a square mile. The northern and eastern shores are very irregular in form, jutting out frequently into bold peninsulas and promontories and being indented with numerous immense inlets, chief of which are the estuaries of the Obi (575 m. in length) and of the Yenesei; the gulf of Anadir, and the sea of Okhotsk. All the island groups to the n. of Siberia, and since 1875 the whole of Sakhalin or Saghalien on the e. coast, belong to Siberia; whereas, since 1875, all the Kurile islands are Japanese. The Liakhoff group, near the mouth of the Lena, consists of three islands from 60 to 100 m. long by 20 to 40 broad, and of numberless islets: they are completely barren, and present in their soil and subsoil alternate layers of sand and ice, in which are imbedded the fossil remains of numerous animals. The greatest length of Siberia is 5,600 m. from n.e. to s.w., and the greatest breadth 2,170 m. from n. to south. A country of such vast extent (greatly larger than Europe) must necessarily exhibit great varieties of climate; and we accordingly find in the northern regions, much of which lie far within the Arctic circle (cape Chelyuskin, which is the most northerly promontory of Siberia, and of the old world, being in lat. 78° 25' n.), an extensive tract bordering on the ocean, composed of swamp, moorland, and mossy flats, covered with snow and ice for one-half of the year, and even during the greatest heats of summer, released from its icy bonds only to the depth of a few inches below the surface of the soil. The ocean, its northern boundary, is frozen for miles seaward during more than half the year, and during the remaining months, the numberless icebergs and flocs which crowd the sea, and continually come into collision, render the navigation so dangerous that no complete hydrographic survey of the coast has yet been made. On the southern boundary of this semi-barren zone, stunted misshapen bushes and trees are found; and as we advance southward, vegetation appears in the form of extensive forests of birch, fir, and larch, which clothe the plains and hill-sides, and are interspersed with stretches of pasture of moderate quality. After crossing the parallel of lat. 64° n. in west Siberia, and that of lat. 61° n. in east Siberia, the more hardy cereals, barley, oats, and rye, begin to appear, and the soil increases in fertility, sometimes to an extraordinary extent, thick woods of Siberia cedar and other trees clothe the mountain sides, and the valleys, especially along the banks of rivers, are in a state of continuous cultivation. The whole of western Siberia is one great plain, sloping from its southern boundary, where the average elevation is 2,000 ft., northward to the Arctic ocean; with the exception of the small corner in the s.w., which is drained into the Caspian and Aral seas. The fertility of a great portion of the governments of Tobolsk and Tomsk, especially of the *Baraba* and *Ishim* steppes, is proverbial, and they are the great granaries of Russia and northern Europe. But the warmest and perhaps most fertile part of western Siberia is the valley of the Yenesei, n. of the Sayansk mountains. Eastern Siberia is more hilly and less fertile than the western portion, but the valleys and hill-sides afford good pasture. Four-fifths of Siberia is drained by the three immense rivers Obi, Yenesei (q.v.), and Lena (q.v.), and by a number of smaller rivers, all of which flow to the Arctic ocean. Siberia has a large number of lakes, some of which are little else than

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salt marshes; the largest of them are lake Baikal (q.v.) and lake Balkash (q.v.). The chief mountain range of Siberia is the Altai chain, which forms the southern boundary toward Mongolia, and ramifies eastward and northward from the region of lake Baikal, covering a large portion of the surface of eastern Siberia. The Stanovoi hills stretch from the Amur n.e. along the shores of the sea of Okhotsk. The Yablonnoi mountains, which long found a place in books of geography, were shown by the Russian exploring commission (1863) to have no existence, the place where they were supposed to be situated being an undulating plateau, which connects the basin of the Indigirka and the sea of Okhotsk. Lofty mountain-chains traverse the island of Saghalien and the peninsula of Kamtchatka, in which there are 21 active volcanoes, the loftiest of which is Kliutshewsker; elevation 15,000 feet. Among the wild animals of Siberia are the reindeer in the northern flats, and on the high mountains of the s.; the arctic or black fox, and white bear in the n.; the sable, ermine, marmot, marten, squirrel, Caspian antelope, and wild sheep—all in the s.; and the lynx, wolf, wild-boar, and glutton are generally diffused. Camels are found among the Kirghiz, along with the broad-tailed sheep, the Russian sheep being also domesticated in Siberia; and horses of good quality, an inferior sort of cattle of the Russian breed, and a large wolfish-looking dog, used chiefly to draw sledges, complete the list of domestic animals. Fresh and salt water fish abound, and feathered game is plentiful in the south. The mineral wealth of Siberia is great: gold, silver, copper, and lead are found in all the mountainous districts on the w. and s.; platinum, iron, and precious stones, including diamonds, are found on the eastern slopes of the Ural; zinc, antimony, arsenic, plumbago, and valuable emerald and topaz mines are worked in the districts n. of the Amur; and porphyry, malachite, jasper, and salt (from the steppes) are common. More than half of the inhabitants of the central and western provinces are Russians and Poles, or of Russian and Polish descent, and these have been sent to the country either as exiles, on account of political or criminal offenses, or as government colonies. The most abandoned class of exiles are kept to hard labor in the mines; others are put to less laborious, but still compulsory work; and a third portion are settled in specified districts, under surveillance of the police, and allowed to employ themselves as they choose. This last class chiefly employs itself in trapping those animals whose skins and furs form valuable articles of trade. In the north-west are found the Samoieds, and adjoining them the Ostiaks, both of whom live by hunting and fishing alone. In the s. are the nomad tribes of the Kirghis (q.v.) and Kalmuks (q.v.), both cattle-breeding peoples, though the latter have now partially adopted a settled mode of life, and manufacture iron and gunpowder. Next to them, on the borders of Manchooria, are the Buriats, a people of Mongol origin, and the most numerous tribe in Siberia; to the n. of whom are the Yakuts and Tunguses, of Tartar origin, who are spread over the whole of eastern Siberia, from the town of Irkutsk to the Stanovoi range, and live mostly by hunting. The Tchuktchis, an Esquimaux race, and the Koriaks inhabit the n.e. corner, and the Manchus are the population of the Amoor territory. Manufactures are unimportant, and are confined to the principal towns; the barter trade in European goods is carried on at Obdorsk, Ostrovnoe, Yakutsk, and Petropavlovsk; and the transit-trade with China through Kiahta (q.v.), the imports from China being tea of the finest quality, sugar, silk, cotton, wool, grain, fruits, etc.; and the exports to that country, cotton and woollen cloths, linen, furs and skins, leather, and articles of gold and silver. The exports to Russia are the natural produce of the country, and are transported westward to the frontier by alternate land and river carriage, to Tobolsk, thence over the Ural mountains to Perm. Reindeer sledges are the usual means of transport in winter. Fairs are held at stated periods in certain localities, and much of the trade of the country is there transacted. The chief towns in Siberia proper are Tobolsk, pop. 20,175; Tjumen, 13,000; Tomsk, 36,742; Irkutsk, 43,962. Siberia seems to have been first made known to the Russians by a merchant named Anika Stroganoff; and soon after, the conquest of western Siberia was effected by the Cossack Vassili Yermak, an absconded criminal, at the head of a numerous band of wild followers. After Yermak's death in 1584, the Russians pursued their conquests eastward, founding Tomsk in 1604, and though they often experienced serious reverses, their progress was rapid, the sea of Okhotsk being reached in 1639, and Irkutsk founded in 1661. Frequent disturbances have occurred between the Russians and the Chinese and Tartars, which have resulted in the extension southward of the Siberian boundary into Manchooria and Turkistan (q.v.). In 1845 the left bank of the Amoor became Russian. In 1858 the frontier was extended along the sea-board s. of the river to the frontier of Corea. The Russians have now a large number of steam-vessels on the Amoor. Recent voyages of exploration point to the practicability of opening direct and extensive commerce between Archangel and the rivers Obi and Yenesei. The Lena is also navigable for a great distance from its mouth. See Atkinson's *Siberia*, Lansdell's *Through Siberia* (1882), Eden's *Frozen Asia* (1880), and Kennan's articles in the *Century Magazine* on the Siberian exile system. For an account of the Trans-Siberian railway, see RUSSIA.

SIBLEY, a co. in central Minnesota, bordered on the e. by Minnesota river; 588 sq. m.; pop. '90, 15,199. The surface is undulating, and is partly covered with forests. It contains lake Minnetonka, 30 m. in length, and other lakes of smaller size. The soil is fertile. Co. seat, Henderson.

SIBLEY, HENRY HASTINGS, b. Detroit, Mich., 1811; son of judge Solomon Sibley, lived for many years at Mackinaw and fort Snelling, employed by the American Fur co. He was delegate from the territory of Minnesota, 1849-53; first governor of the state, 1858; during the late war brig. gen. of vols. He took charge of an expedition against the Indians on the Minnesota frontier, 1863; brevetted maj. gen. of volunteers;

SIBLEY, HIRAM, b. Mass., 1807; in early life he was a manufacturer of machinery, but became interested in telegraph corporations, and by his exertions about twenty weak companies were united in one, the Western Union, thus establishing the business on a strong foundation. He was prominent in securing the building of the Pacific telegraph line, and was intending to carry a line to Europe by way of Behring strait had the Atlantic cable failed. Mr. Sibley contributed \$100,000 each to the universities of Cornell and Rochester. He d. 1888.

SIBLEY, JOHN LANGDON, b. Me., 1804; educated at Harvard college, of which he was librarian, 1825-26, 1841-56, and 1856-77. Mr. S. wrote a history of *Union, Maine*; *Notices of the Triennial Catalogues of Harvard University*, and *Harvard Graduates*. His rank among librarians was high. He d. 1885.

SIBYL (Gr. *sibulla*, according to the old derivation from *dios boule*; Doric, *sios bolla*—the “will or counsel of God”), the name anciently given to several prophetic women, whose history, in so far as they have any, has come down to us in a wholly mythical form, if, indeed, such beings ever existed at all. Their number is differently given; some writers (Ælian, for example) mention only four—the Erythræan, the Samian, the Egyptian, and the Sardinian; but in general ten are reckoned, viz., the Babylonian, the Libyan, the Delphian, the Cimmerian, the Erythræan, the Samian, the Cumæan, the Trojan or Hellespontian, the Phrygian, and the Tiburtine. Of these, by far the most celebrated is the Cumæan, identified by Aristotle with the Erythræan, and personally known by the names of Herophile, Demo, Phemonoë, Deiphobe, Demophile, and Amalthæa. She figures prominently in the 6th book of Virgil’s *Æneid*, as the conductor of the poet into the realm of the shades. The Roman legend concerning her (as recorded by Livy) is, that she came from the east, and appearing before king Tarquin the proud, offered him nine books for sale. The price demanded appeared to the monarch exorbitant, and he refused to purchase them. She then went away, destroyed three, and returning, asked as much for the remaining six as for the nine. This was again refused, whereupon she destroyed other three, and once more offered to sell him the rest, but without any abatement of the original price. Tarquin was struck by her pertinacity, and bought the books, which were found to contain advices regarding the religion and policy of the Romans. They were preserved in a subterranean chamber of the temple of Jupiter on the Capitoline, and were originally intrusted to two officials (*duumviri sacrorum*), appointed by the senate, who alone had the right to inspect them. The number of keepers was afterward increased to 10 (*decemviri*), and finally, by Sulla, to 15 (*quindecimviri*). In the year 84 B.C., the temple of Jupiter having been consumed by fire, the original sibylline books or leaves were destroyed, whereupon a special embassy was dispatched by the senate to all the cities of Greece, Italy, and Asia Minor, to collect such as were current in these regions. This being done, the new collection was deposited in the temple of Jupiter after it had been rebuilt. Spurious sibylline prophecies—or what were regarded as such—accumulated greatly in private hands toward the close of the republic; and Augustus, fearing, perhaps, that they might be turned to political uses, ordered them all to be given up to the city-prætor, and burned them. More than 2,000 were destroyed on this occasion. The remainder were kept in the temple of Apollo, on the Palatine, under lock and key; but the whole perished during the burning of Rome in the time of Nero. Other collections were made; and as late as the 6th c., when the city was besieged by the Goths, there were not wanting some who pretended to predict the issue from a consultation of these venerable oracles. It is, however, beyond doubt, that as early, at least, as the 2d c. A.D., when enthusiastic men sprang up in the Christian church, prophesying in a poetic-oracular style (whence they were sometimes called *sibyllists*), the sibylline books were much interpolated and falsified to assist the progress of the new faith. The utterances of these Christian sibyllists form a special department of early ecclesiastical literature, and are a mixture of Jewish, pagan, and Christian ingredients. The collections of them also bear the name of “sibylline books.” An edition was published by Gallæus, at Amsterdam, in 1689, and was entitled *Oracula Sibyllina*; fragments have also been edited by Angelo Mai (Milan, 1817) and Struve Königsberg, 1818).—Consult Bleek, *Ueber die Entstehung und Zusammensetzung der uns in acht Büchern erhaltenen Sammlung Sibyllinischer Orakel* (in Schleiermacher’s *Theologische Zeitschrift*, Berl. 1819) and Thorlacius, *Libri Sibyllistarum Veteris Ecclesiæ* (1822); Ewald, *Ueber Entstehung, Inhalt und Werth der Sibyllinischer Bücher* (Gött. 1858); and Volkman.

SICILIAN VESPERS, the name given to the massacre of the French in Sicily, on the day after Easter (March 30), 1283, the signal for the commencement of which was to be the first stroke of the vesper-bell. In the articles NAPLES, KONRADIN, MANFRED, etc., it is related how Charles of Anjou, the brother of Louis IX. of France, had deprived the Hohenstaufen dynasty of Naples and Sicily, and parceled out these kingdoms into domains for his French followers; but his cruelty toward the adherents of the dispossessed race, his tyranny, oppressive taxation, and the brutality of his followers, excited

among the vindictive Sicilians the deadliest animosity. The aged Giovanni da Procida, a steady partisan of the Hohenstaufen family, took the lead in directing and systematizing a conspiracy against Charles and his followers; and after a visit to Pedro of Aragon (the husband of Constance the cousin of Konradin, and the next heir to Naples and Sicily), whom he found willing to undertake the conquest of Sicily, he returned to his self-imposed duty in the island. On the evening of Easter-Monday the inhabitants of Palermo, enraged (according to the common story) at a gross outrage which was perpetrated by a French soldier on a young Sicilian bride, precipitated the accomplishment of the scheme by suddenly rising upon their oppressors, putting to the sword every man, woman, and child of them, not sparing even those Italians and Sicilians who had married Frenchmen. This example was followed, after a brief interval, by Messina and the other towns, and the massacre soon became general over the island: the French were hunted like wild beasts, and dragged even from the churches, where they vainly thought themselves secure. More than 8,000 of them were slain by the Palermitans alone. Only one instance of mercy shown to a Frenchman is on record, the fortunate subject being a Provençal gentleman, Guillaume des Porcellets, who was much esteemed for his probity and virtue. The governor of Messina also succeeded in passing the strait with his garrison before it was too late.—See Amari, *La Guerra del Vespro Siciliano* (Palermo, 1841; 6th ed. Flor. 1859), and Possien and Chantrel's *Les Vêpres Siciliennes* (Paris, 1843).

SICILIANA, in music, a name given to a slow, soothing, pastoral description of air, in $\frac{3}{4}$ time; so called because the dance peculiar to the peasantry of Sicily possesses this character.

SICILY, the largest, most fertile, and most populous island in the Mediterranean sea, lies between lat. $36^{\circ} 41'$ and $38^{\circ} 18'$ n., and between long. $12^{\circ} 30'$ and $15^{\circ} 40'$ e., and is separated from the main-land of Italy by the strait of Messina. Its shape roughly resembles a triangle (whence the early Greek navigators gave it the name of *Trinacria*, the "Three-cornered")—the eastern coast, from Capo del Faro in the n. to Capo Passaro in the s., forming the base; and the northern and south-western coasts the sides, which gradually approach each other toward the n.w. The length of the base is 145 m.; of the northern side 215 m.; and of the south-western 190 m.: the circumference of the island, including the sinuosities of the coast, is estimated at 624 miles. Area about 9936 sq. miles. Pop. according to an estimate of Dec. 31, 1895, 3,494,125. Capo Passaro, at the south-eastern extremity, is only 56 m. from Malta; and Capo Boco, near Marsala, at the north-western, only 80 m. from cape Bon on the African coast.

Physical Geography.—The island of Sicily, like the main-land of Italy, is traversed throughout its entire length by a chain of mountains, which may be looked upon as a continuation of the Apennines (q.v.). This chain, beginning at Capo del Faro on the strait of Messina, runs in a south-south-western direction as far as Taormina, where it turns off to the w., and stretches across the whole island, keeping, however, much nearer to the northern than to the south-western coast. The first part of the chain, from Capo del Faro to Taormina, is called the Peloric range (anc. *Neptunius Mons*), which in Monte Dinamare attains the height of 3,260 ft.; the second and much the longer part is called the Madonian range (anc. *Nebrodes Montes*), which, in the Pizzo di Case, rises to an elevation of 6478 feet. It forms the great watershed of the island. Toward the north-western coast the chain breaks up into irregular and often detached masses, such as Monte Pellegrino (1903 ft.) and Monte San Giuliano (2460 ft.). About the center of the chain a range branches off through the heart of the island to the s.e.; at first wild and rugged, but afterward smoothing down into table-lands, which in turn slope away tamely to the sea. There are innumerable other spurs to the s. from the great Madonian chain, of inferior length and elevation, but none of these require special mention. The volcano of Etna, which rises in solitary grandeur on the eastern coast, is separately described. See **ETNA**. Sicily is not, on the whole, a well-wooded country, but forests of considerable size are found here and there as, for example, the royal forests near Caronia and Mezzojuso, the forest-zone of Etna, etc. In the interior of the island there is not much level land, but on several parts of the coast there are extensive plains, generally of great fertility. The principal of these are the great plain of Catania (anc. *Campi Leontini*), out of which rises Etna; the plains of Palermo, termed the *Conca d'Orò*, or "Golden Shell," of Castellamare, of Licata, and Terranova.—Although rivers are numerous, none are navigable. The largest are the Simeto or Giarretta, the Cantara, the Salso, the Platani, and the Belici.

Climate.—The climate of Sicily is very warm, but salubrious, except in low-lying places where there is a mephitic atmosphere. The best health is enjoyed in the lower regions of Etna, which is very densely peopled, although exposed to eruptions and violent earthquakes. The heat is intense in summer when the sirocco blows. After the autumnal equinox violent winds are prevalent, torrents of rain fall, and all along the coasts the atmosphere is charged with moisture and fogs. The earthquakes begin about the end of winter, and do great damage. Snow and ice are rarely to be seen except on Etna, and the highest points of the other mountains.

Geology and Mineralogy.—The primary rocks in the mountainous districts are chiefly quartz, granite, and mica. In some parts these are overlaid by limestone rocks. Most

of the lower ranges of hills are of calcareous formation, and are rich in metallic ores. Sulphur forms the chief mineral wealth of Sicily. Immense beds of it are found in the central and northern parts of the island. In 1895, 347,113 tons of sulphur were exported, and the mines are worked by Cornish miners and their descendants; other minerals found are rock salt, copper, silver, lead, antimony, marbles, jaspers and agates.

Soil, Agriculture, etc.—The soil of the island is so fertile that very little labor is required to raise the crops. In many valleys there is rich soil to the depth even of 40 feet. In Catania decomposed lava is spread over the ground, greatly increasing its fertility. The crops of grain are large, and might be prodigious if agriculture were better understood. The papyrus, sugar cane, date palm, and other tropical plants flourish. The harvests are such that they recall to mind the words of Livy, in speaking of Sicily, "*Populorum Romano, pace ac bello, fidissimum annonæ subsidium*" (lib. xxvii. 5). In more recent times the restrictions on the exportation of grain served not only to keep agriculture from making any progress, but also to put a drag upon the commerce of the country; which, on every attempt made to raise itself, was met by fresh obstacles in the shape of new taxes. The Italian government has greatly alleviated the obstacles to agriculture, and the salutary effects of the change of system are already apparent. The soil produces corn, maize, flax, hemp; excellent cotton near Mazzara and in Catania; sugar, equal to that of the East Indies, along the southern coast; grapes, olives, saffron, oranges, lemons, citrons, potatoes, pomegranates, figs, pistachios, dates, castor-oil, mulberry, sumach, tobacco, and manna. The vine has been cultivated with the greatest care at Marsala since 1789, when an English firm, settled there, began to export it. In 1894 135,000,000 gallons of wine were produced.—Sicily possesses the best tunny-fisheries in the Mediterranean. The fisheries for coral at different places on the coast are also industriously carried on.

Manufactures, Commerce, etc.—The manufactures of Sicily are insignificant, and are nearly altogether confined to silk, cotton, and leather.—The most important articles of export are sulphur, sumach, fruits, and wine; of import, cottons, woollens, silks, linens, earthenware, hardware. Great Britain, France, and the United States are the countries with which the Sicilians chiefly carry on commerce. The statistics of exports and imports are untrustworthy, but the latter considerably exceed the former. In 1894, 633 miles of railways were in operation.

Religion, Education, etc.—With the exception of a comparatively small number of Greeks, and Jews, the inhabitants are all Roman Catholics; but though equally ignorant, they are not so superstitious as the Neapolitans; at least their superstition has not destroyed their love of political freedom, as has repeatedly been evinced in their history—most recently in the ardor with which they responded to the summons of Garibaldi to liberate themselves from the tyranny of the Bourbons. There are three universities—at Palermo, Catania, and Messina; and there were in 1892 66 high schools, 6 technical institutes, and 41 technical schools, besides a large number of elementary and primary schools.

Political Divisions.—Sicily is divided into 7 provinces or prefectures—viz., Palermo, Messina, Catania, Noto or Siracusa, Caltanissetta, Girgenti, and Trapani. Each province is subdivided into 3 or 4 districts, and these again into numerous *communi*, or "townships." Over the province is placed an *intendente*, or, as he is now called, a "prefect;" over the district a sub-prefect; and over the commune a *sindaco* ("syndic," or "mayor"). The prefect presides over every department of the provincial administration, and also over the provincial council—a body composed of from 15 to 20 land-holders, who meet once a year, and sit for 20 days, examining the accounts of the province, and framing the provincial budget. The two subordinate divisions have also their "councils;" and the members of all three are appointed either by the king, or by the prefect. Of course this insular self-government does not supersede the necessity of sending Sicilian deputies to the national parliament at Rome.

History.—Sicily, was inhabited, in prehistoric times, by a people who bore the name of *Siculi* or *Sicani*, and who, according to a universally received tradition—crossed over into the island from the southern extremity of the mainland. Their names and every fact that we can ascertain about them, lead to the supposition that they were members of the great Latino-Italian family that, entering Italy from the n., gradually pushed its way across the Apennines to the peninsula of Bruttium (see article *ROME*). Beyond this rational conjecture, however, we cannot proceed, and the actual history of Sicily only begins to emerge out of utter darkness with the establishment of Greek and Phœnician colonies. The earliest Greek colony, that of Naxos, was founded 735 B.C.; the latest, that of Agrigentum, 580 B.C. During the intervening century and a half, numerous important colonies were established (either directly from Greece or as offshoots from the older Greek settlements in the island); Syracuse (734 B.C.), Leontini and Catana (730 B.C.), Megara Hyblæa (728 B.C.), Gela (690 B.C.), Zancle, later Messina (date of origin uncertain), Acraë (664 B.C.), Himera (648 B.C.), Mylæ (date of origin uncertain), Casmenæ (644 B.C.), Selinus (628 B.C.), Camarina (599 B.C.), Agrigentum (580 B.C.). The earlier history of these cities is almost unknown. What is recorded is vague and general. We read that they attained great commercial prosperity, that they subjugated or wrested from the Siculi, Elymi, and other "native" tribes, large portions of neighboring territory; and that their governments (like those of the republics in the mother-country) were

at first oligarchical, and latterly democracies or "tyrannies;" but it is not till the period of the "despots" that we have detailed accounts. Then the cities of Agrigentum and Gela acquire prominence—the former, under the rule of Phalaris (q.v.), becoming, for a short time, probably the most powerful state in Sicily; and the latter, under a succession of able tyrants, Cleander, Hippocrates, and Gelon (q.v.), forcing into subjection most of the other Greek cities. Gelon, however, transferred his government to Syracuse (one of his conquests), which now became the principal Greek city of Sicily—a dignity it ever after retained. Contemporary with Gelon, and possessed of the same high capacity for governing, were Theron, "tyrant" of Agrigentum, and Anaxilaus, tyrant of Rhegium, and conqueror of Zancle, to which he gave the name of Messana. Meanwhile, the Carthaginians—a people wholly different from the Greeks, in language, religion, origin, and civilization—had obtained possession of the Phenician settlements in Sicily. The first appearance of the Carthaginians in the island dates from 536 B.C.; but the steady growth of the Greek cities in wealth and power, long confined their rivals to the north-western part, where their principal colonies were Panormus, Motya, and Soloeis. The first open trial of strength took place in the great battle of Himera, where the Carthaginian army was utterly routed by Gelon, and its leader, Hamilcar, slain. The Gelonian dynasty at Syracuse fell 466 B.C., after experiencing various fortunes. During the next 50 years the island had peace. In 410 B.C., however, the war between the Carthaginians and Greeks for the possession of the island was renewed. The successes of the former were great and permanent. Selinus, Himera, Agrigentum, Gela, and Camarina, fell into their hands in less than five years; and it was not till Syracuse had got a new "tyrant," the famous Dionysius (q.v.) the elder, that fortune again began to smile on the Greeks. Even he, however, could not wrest from the Carthaginians what they had already won; and after the war of 383 B.C., a peace was concluded, which left Dionysius in possession of the eastern, and the Carthaginians of the western, half of the island. The dissensions and tumults that followed the decease of Dionysius, illustrate forcibly the peculiar dangers to which the Greek republics, either at home or abroad, were prone; but we can only afford to notice the triumph of the popular party under Timoleon (343 B.C.), and the splendid victory of the latter over the Carthaginian generals, Hasdrubal and Hamilcar, at the river Crimisis, 340 B.C. Once more Greek influence was in the ascendant, but the rule of the bold and ambitious tyrant Agathocles (317–289 B.C.) proved in the main disastrous to Greek supremacy. After his death Syracuse lost her hold over many of the Greek cities, which established a weak and perilous independence, that only rendered the preponderance of the Carthaginians more certain. Finally, Pyrrhus (q.v.), king of Epirus, was invited over to help his countrymen, and in 278 B.C. he landed in the island. The brilliant adventurer—one of the most romantic figures in classic history—for a time swept everything before him. Panormus, Ercte, and Eryx were captured; and though he failed to make himself master of Lilybæum, he might probably have forced the Carthaginians to surrender it, had he not been thwarted in his designs by the miserable discords and jealousies of the people whom he came to save. As it was, Pyrrhus left Sicily in about two years; and in all likelihood the island would have sunk into a Carthaginian possession, had not a new power appeared on the stage—viz., the Roman. The struggle for supremacy between Rome and Carthage—the most tremendous struggle in ancient history—is sketched in the article *ROME*, and in the biographies of the leading generals, and, therefore, need not be narrated here. Suffice it to say, that in 246 B.C., Carthaginian Sicily, and in 210 B.C., the whole island became a Roman "province"—the first Rome ever held. Henceforth it shared the fortunes of the great state to which it was annexed, and its special history need only be rapidly glanced at. In 135–132 B.C., and again in 103–100 B.C., it was the scene of two formidable slave-insurrections, during which it was frightfully devastated. Its fertility, and the wealth of its citizens and landholders, were also powerful temptations to greedy and unscrupulous governors, of whom we have a specimen in Verres (pretor 73–70 B.C.), "damned to everlasting fame" in the orations of Cicero. Augustus visited Sicily after the close of the civil wars, and established some colonies; but it does not seem to have prospered under the empire; and in 440 A.D. it was conquered by the Vandals under Genseric. The Vandals, in their turn, were compelled to cede it (480 A.D.) to Theodoric king of the Ostrogoths, in whose hands it remained till 535 A.D., when Belisarius conquered and annexed it to the Byzantine empire. In this condition it remained till 827, when the Saracens invaded the island, and after a protracted struggle, lasting for 114 years, expelled the Byzantine Greeks, and made themselves masters of Sicily. They kept possession of it for upward of a century, but after a contest of 30 years, were driven out by Robert Guiscard (q.v.) and Roger de Hauteville, at the head of a body of Normans, aided by the "native" inhabitants, whom we conjecture to have been much the same as they were in the old classic times—for the successive waves of barbaric and Saracenic invasion that swept over the island, appear to have left little trace of their action. Even to this day it is highly probable that the people of Sicily are largely the descendants of the early Siculi. The Normans held rule in the island from 1072 to 1194; and the Norman "kingdom of Sicily and Naples," or "kingdom of the two Sicilies," dates from 1130, when Roger II. obtaining possession of most of the continental dominions of his uncle, Robert Guiscard, assumed the title of king. During the rule of the Swabian dynasty (see *HOHENSTAUFEN*, *HOUSE OF*), 1194–1258, the political

history of Sicily is the same as that of Naples; but in 1282, after the dreadful massacre of the French, known as the Sicilian Vespers (q. v.), it again became independent, chose for its king Pedro III. of Aragon, who was the sole representative by marriage of the house of Hohenstaufen, and remained in the possession of the Aragonese sovereigns till 1505, when the union of the crowns of Castile and Aragon—in other words, the rise of the Spanish monarchy in the persons of Ferdinand and Isabella—placed it under the dominion of Spain. The fortune of war also gave Ferdinand the possession of Naples; and the Spanish kings retained both countries until the war of the Spanish succession, 1700–13 (see SUCCESSION WARS). By the treaty of Utrecht (1713), Sicily was separated from Naples, and handed over to Victor Amadeus, duke of Savoy, who, however, restored it to the crown of Naples by the treaty of Paris, seven years after, receiving in exchange the island of Sardinia. From 1720 the two countries continued under the same dynasty, the house of Austria, 1720–34; and the Spanish Bourbons, 1734–1860 (if we accept the brief rule of the French in Naples, 1806–15, when Joseph Bonaparte, and afterward Joachim Murat, were kings), down to the period of Garibaldi's invasion (see ITALY, and GARIBALDI), which resulted in the annexation of both to the new kingdom of Italy under Victor Emmanuel.

SICKINGEN, FRANZ VON, 1481–1523; b. in the duchy of Baden; became a distinguished soldier, and ably supported the cause of the emperors Maximilian and Charles V. He was noted as the champion of the oppressed, resisting the despotism of princes and the arrogance of the clergy; supported Lutheranism in the Rhenish provinces, and as the patron of learning protected Reuchlin, Æcolampadius, and Ulrich von Hutten. Involved in a feud with Hesse and the Palatinate, he was mortally wounded while defending his castle.

SICKLES, DANIEL EDGAR, b. N. Y., 1825; educated at the university of New York; studied law and began to practice in 1844. He soon became a politician, served in several offices, was secretary to the English legation in 1853, and was member of congress, 1856–62. In 1859 he shot and killed Philip B. Key for alleged intimacy with his wife, and was tried for murder, but acquitted. In 1861 he raised and became col. of the Excelsior (New York) brigade. He commanded a brigade under Hooker, and at Antietam and Fredericksburg was at the head of Hooker's old division. At Chancellorsville and Gettysburg he commanded the 3d corps. In 1869 he became minister to Spain, resigning in 1874. From 1893 to 1895 he was a member of congress.

SICULIA'NA, a city of Sicily, province of Girgenti, and 9 m. n.w. of the city of that name. It stands on the sea, and has a small harbor. Pop. about 6,000.

SICYON, the principal city of a very small but exceedingly fertile state of ancient Greece, Sicyonia, situated in the n. of the Peloponnesus, having the Corinthian gulf for its northern boundary, with Achaia on the w., Phlius on the s., and Corinth on the east. The territory was level toward the sea, somewhat mountainous in the interior, and well watered by the two rivers Asopus and Helisson, between which on a triangular plateau was situated Sicyon, about 2 m. s. of the Corinthian gulf, and 10 n.w. of Corinth. Round the three sides of the plateau ran a wall, which combined with the precipitous nature of the heights that surrounded it rendered the position of Sicyon one of great strength. It is supposed that at one time it had, like Athens, a double wall reaching from the city to the port on the sea of Corinth. Sicyon was anciently celebrated as a chief seat of painting and statuary (tradition asserting that the former was invented there), it having given its name to a school of painting which included among its disciples Pamphilus and Apelles, both natives of Sicyon. It was also the native city of Aratus (q. v.), the gen. of the Achaean league. There exist at the present day a few remains of the ancient city, as well as of the more modern buildings erected by the Roman conquerors of Greece, near which stands a small modern village named *Vasilika*.

SIDA, a genus of plants of the natural order *malvaceae*, containing a large number of species, annual and perennial herbaceous plants and shrubs, mostly natives of warm climates and widely diffused. They generally abound in mucilage, and some of them are used in medicine in India, as the mallow and marsh-mallow are in Europe. They have also strong pliable fibers, which are employed for cordage and for textile purposes. —*S. tiliifolia*, an annual, has long been cultivated in China, where it is called *king-ma*, for the sake of its fiber, which is used like that of hemp. It is too tender for the climate of Britain, but its cultivation has been introduced into Italy and France.

SIDDONS, MRS. SARAH, was the daughter of Mr. Roger Kemble, a provincial actor, and was born at Brecon, in South Wales, on July 5, 1755. As a mere child she was brought on the stage on the occasion of a benefit of her father's, and from that time up to her 15th year she continued to act as a regular member of his company. An attachment having sprung up between her and a young Mr. Siddons, an actor, with the somewhat reluctant consent of her parents, she was married to him at Trinity church, Coventry, on Nov. 26, 1773, and in company with her husband went to act at the Cheltenham theater. Here she speedily drew great attention; and Garrick, hearing her praises in London, sent to Cheltenham a trusty emissary to report upon her. The result was an engagement offered her at the London Drury Lane theater, where, Dec. 29, 1775, she made her first appearance, acting Portia in *The Merchant of Venice* to the

Shylock of Mr. Garrick. Her beauty and fine person pleased the audience, but as an actress she made no great impression, and at the close of the season she failed to secure a re-engagement. It was considered that this was to some extent due to her having vexed the irritable vanity of Garrick by an unintentional error in stage business, which made him act with his back to the public in one of his pet passages, a mortification which the great man was little enough to remember and resent.

Leaving London thus in failure in 1776, in 1782 she returned to it to run a career of triumph as indisputably the greatest actress of her time. The intervening years she had passed in the exercise of her art on the stages successively of Birmingham, Manchester, York, and Bath, till the growth of her provincial reputation determined her recall to the metropolis. In 1784 her popularity was temporarily obscured by a calumny industriously circulated, which charged her with ungenerous and illiberal conduct toward certain of her fellow-performers; but with this trivial exception, till on June 29, 1812, in her great character of Lady Macbeth, she took her leave of the public, her course was one long series of successes. Subsequently she occasionally consented to reappear on the stage for charitable ends, or to promote a stage "benefit" in which she had a kindly interest. Her death took place in London on June 8, 1831.

As a tragic actress Mrs. Siddons has probably never been equaled in Great Britain; as a woman she was of unblemished reputation, and enjoyed the respect of all who knew her. She was the ornament of every society into which she went, and such was the estimation in which she was held, that she had access at will to almost any. Her genius is said to have been strictly a *stage* genius; elsewhere she seems to have been a woman of no extraordinary parts. But she had a certain way of making her mediocrities imposing. She carried her tragedy manners with her to the drawing-room or the dinner-table: Scott has recorded the amusement with which at Abbotsford he heard her stately blank verse to the domestic:

"I asked for water, boy! you've brought me beer;"

and Sidney Smith used to say it was never without a certain awe that he saw her "*stab the potatoes.*"

SIDE-BONES are enlargements situated above a horse's heels, resulting from the conversion into bone of the elastic lateral cartilages. They occur mostly in heavy draught horses with upright pasterns, causing much stiffness, but, unless when of rapid growth, little lameness. They are treated at first by cold applied continually, until heat and tenderness are removed, when blistering or firing must be resorted to.

SIDEREAL CLOCK, a clock so regulated as to indicate *sidereal time*. See **DAY**. The sidereal clock is a most important aid to the practical astronomer, and is one of the indispensable instruments of an observatory.

SIDEROGRAPHY (Gr. *sideros*, iron). The name applied by the inventor, Mr. Dyer, to a process of printing with compound iron (or rather steel plates, for they are case-hardened after engraving) plates, instead of plain plates of copper or steel. It is the plan now usually employed in printing bank-notes in which more than one color is given. The colored parts of the design are cut out of the main plates, and movable pieces are exactly fitted in, so that they can be retracted or pushed forward at will. They are withdrawn while the main plate is receiving its ink, and they are pushed forward beyond while receiving their supply of ink. This being done they are brought to one plane, and form a complete plate for printing from.

SIDEROX YLON, a genus of trees of the natural order *sapotacea*, having evergreen leaves and axillary clusters of flowers, natives of warm climates, and very widely distributed. They are remarkable for the hardness of their wood, which is sometimes called iron-wood, and is at least in some species so heavy as to sink in water.

SIDGWICK, HENRY, M.A., was born at Skipton, in Yorkshire, in 1838, and was educated at Rugby and Trinity College, Cambridge. He was Fellow of Trinity College from 1859 to 1869; and Lecturer from 1859 to 1875, when he was appointed Prælector of Moral and Political Philosophy; and in 1883 he was appointed Knightbridge Professor of Moral Philosophy. Mr. Sidgwick is the author of works on *The Methods of Ethics* and the *Principles of Political Economy, Elements of Politics* (1891). He took a prominent part in the promotion of the higher education of women at Cambridge, and was one of the founders of Newnham college.

SIDI MOHAMMED, 1803-73; b. Morocco; son of Abderrahman, whom he succeeded in 1859 as emperor of Morocco. He was soon involved in a war with Spain, caused by the robberies of the Rif pirates, was defeated by the Spanish under Prim and O'Donnell, and obliged to pay Spain an indemnity of 20,000,000 piasters. His introduction of reforms and the commercial concessions which he granted to foreigners caused several insurrections, in quelling one of which he lost his life.

SID/LAW HILLS. See **FORFARSHIRE** and **BIRNAM**.

SIDMOUTH, a market t. and watering place on the s. coast of Devonshire, at the mouth of the little river Sid. Sidmouth was a borough and market-town, governed by a port-reeve, as early as the 13th century. It was anciently a place of some importance as a fishing-town and seaport, but the fishery has declined, and the harbor is in great measure filled up with sand and shingle, so that it is now accessible to small boats only. The town has for many years past been a favorite watering-place, remarkable for the

mildness and salubrity of its climate. The hills on each side of the valley of the Sid rise to a considerable height, and, where they terminate on the sea coast, form bold and lofty cliffs, e. and w. of the town, known respectively as Salcombe hill and High peak, about 500 ft. above the sea. Owing to the narrowness of the valley, the town presents no large frontage toward the sea; but the esplanade, protected by a sea wall 1700 ft. in length, built in 1838 to stop the encroachment of the sea, forms an excellent promenade. Villas and detached houses extend for some distance inland up the valley of the Sid on both sides of the stream. The town is neatly though irregularly built, lighted with gas, and paved, and contains baths, public rooms, etc. Pop. '80, 3,501. Some Roman remains have been found here. Sidmouth gives the title of viscount to the Addington family.

SIDNEY, ALGERNON, grand-nephew of the famous sir Philip Sidney, was b. in the year 1622. He received a careful education, and accompanied his father, the earl of Leicester, to Denmark and France, whither the latter had been sent on embassies. In 1641 he served with some distinction against the rebels in Ireland, of which country his father was then lord-lieut. for the king. Subsequently, in 1643, along with his elder brother, the viscount Lisle, he crossed to England, ostensibly to take service under the king, then at war with his parliament. The two brothers, however, on their arrival, joined the parliamentary forces. At the battle of Long Marston Moor, in which he was sharply wounded, Algernon's courage and capacity were conspicuous; and in evidence of the estimation in which he came to be held by his party, we find him, in 1646, lieut. gen. of the horse in Ireland, and governor of Dublin; and, subsequently, in 1647, after receiving the thanks of the house of commons for his services, appointed governor of Dover. The year before, he had been returned to parliament as member for Cardiff. In 1648 he was one of the judges at the king's trial, and though, for some reason not explained, he neither was present at the passing of sentence, nor signed the warrant of execution, his general approval of the proceedings is not doubted. He is reported to have afterward spoken of the execution as "the justest and bravest action that ever was done in England or anywhere else." In principle a severe republican, he resented the usurpation of power by Cromwell, and during the protectorate lived in retirement at the family seat of Penshurst, in Kent. In 1659, on the meeting of the restored parliament, Sidney was again in his place. He was nominated one of the council of state, and shortly after dispatched to Denmark on a political mission. After the restoration, he lived precariously on the continent, flitting about from place to place, but in 1677, a pardon was procured him from Charles II., and he returned to his native country. Nevertheless, he was still obdurately republican in his opinions, and it is undoubted that he schemed for the overthrow of the monarchy, and the establishment of a republic in its stead; for this end he solicited the aid of the French monarch, and there is evidence of his having been supplied with money by Barillon, the French ambassador. Obscurely his designs were suspected, and in June, 1683, when the Rye house plot was announced, the opportunity was seized to get rid of a man felt to be dangerous. Along with his friend lord Russell and others, he was arrested, and committed to the tower. On Nov. 21 he was tried for high treason before the brutal Jefferies, and on the merest mockery of evidence, found guilty, and condemned to die. On Dec. 7 he was beheaded on Tower hill. He met his death with heroic firmness, amid general sympathy and indignation. He has ever since enjoyed a sort of canonized reputation as a patriot hero and martyr, and it cannot be held undeserved, narrow and impracticable as we must admit his views to have been. In the history and theory of government, Sidney was more deeply learned than any man of his time. His *Discourses concerning Government* were first published in 1698; in 1704 another edition was issued, a third appeared in 1751, and the fourth in 1772. Sidney's life has been written by S. W. Meadley (Lond. 1813). See also Blencow's *Sidney Papers* (Lond. 1813).

SIDNEY, Sir PHILIP, the son of sir Henry Sidney, and Mary, sister to Robert Dudley, the favorite of queen Elizabeth, was b. at Penshurst, in Kent, on Nov. 29, 1554. When 10 years old, he was sent to school at Shrewsbury, whence, in 1569, he went to Christ church, Oxford. From Oxford he passed to Cambridge, which he left with a high reputation for scholarship and general ability. In 1572, as the custom then was for young men of rank, he went abroad on his travels. He was in Paris when the massacre of St. Bartholomew took place, and narrowly escaped being one of its victims. Thereafter, he visited Belgium, Germany, Hungary, and Italy; and in 1575 he returned home, perfected in all manly accomplishments. His uncle, Dudley, earl of Leicester, was at this time in the zenith of his fortunes, and for Sidney a court-career lay temptingly open. As a courtier, his success was great; and with queen Elizabeth he became, and continued while he lived, a special favorite. In 1576, as a mark of her approval, he was sent on an embassy to the court of Vienna, from which he returned in the course of the year following. Shortly after, he had the boldness to address to the queen a "remonstrance" against her proposed marriage with Henry duke of Anjou, a union to which she seemed herself not indisposed. It is significant of the high favor in which he was held by her, that Elizabeth, imperious as she was in temper, and little inclined to brook such interference, seems scarcely at all to have in this instance resented it. About this time, a quarrel with the earl of Oxford led to Sidney's

temporary retirement from court, during which, at Wilton, the seat of his brother-in-law, the earl of Pembroke, he wrote his celebrated *Arcadia*. In 1583 he consoled himself for the marriage of Lady Penelope Devereux, to whom he had been ardently attached, and who figures as the Stella of his poems, by himself marrying Frances, the daughter of sir Francis Walsingham. By this lady he had one daughter, who survived him. In the spring of 1585 he is said to have meditated sailing with sir Francis Drake in an expedition against the Spaniards in the West Indies, but to have been expressly forbidden by Elizabeth, on a ground of anxiety "lest she should lose the jewel of her dominions." It does not seem nicely consistent with this pretty story, that later in the same year she appointed him governor of Flushing, whither he went to take part in the war then being waged between her allies, the Hollanders, and the Spanish. As it proved, she thus sent him to his death. At the battle of Zutphen, in Gelderland, after behaving with conspicuous gallantry, and having a horse killed under him, he received a musket-shot in the thigh, and after lingering for some days in great suffering, he died at Arnheim on Oct. 7, 1586, in the 33d year of his age. A beautiful trait of humanity is recorded of him as he was being borne wounded from the field. He complained grievously of thirst, and a bottle of water was procured for him, from which, as he was about to drink, he was touched by the wistful look up at it of a mortally wounded soldier, who lay close by, and taking it untasted from his lips, he handed it to his fellow in need, with the words: "Thy necessity is yet greater than mine." The estimation in which Sidney was held by his countrymen was shown in the passion of grief with which the news of his death was received. His body was brought to England, and after lying for some time in state, was buried with great solemnity in the old cathedral of St. Paul's, a general mourning on the occasion being observed throughout the country. The universities issued three volumes of elegies on his death, and Spenser, in his *Astrophel*, mourned for the loss of one who as a friend had been dear to him.

The love and admiration which Sidney won from his contemporaries was mainly a tribute to the singular beauty of his character. His short life was illustrated by no brilliant achievement; and his literary genius, though true and exquisite in its kind, would scarcely of itself have sufficed to account for the fervor of regard he inspired. But the purity and nobility of his nature, and the winning courtesies in which its gentle magnanimity expressed itself, took captive all hearts while he lived, and have since kept sweet his memory. "Sublimely mild, a spirit without spot," he lives in the history of his country as a rare and finished type of English character, in which the antique honor of chivalry is seen shading into the graces of the modern gentleman. His *Arcadia*, overrun as it is with the fantastic affectations of the time, may still be recognized by the reader who has patience to peruse it, as a work of indisputable genius, flushed with the lights of a fine imagination, and in its purity and tenderness of sentiment, giving an authentic reflex of the lovely moral nature of the writer. His other chief work, the *Defense of Poesie*, published in 1595, after all that has since been written in the way of philosophical exposition on this and cognate subjects, will even now be found to repay the attention of the reader. Many of his shorter poems, more especially some of his sonnets, are also of rare merit. See Fulke Greville's biography of Sidney, Zouch's memoirs of Sidney (1808), and H. R. Fox Bourne's *Memoirs of Sir Philip Sidney* (1862).

SIDNEY SUSSEX COLLEGE, Cambridge, was founded in 1598 by lady Frances Sidney, countess of Essex, or rather by her executors, in obedience to the instructions of her will. They obtained of queen Elizabeth a mortmain for the purpose, and purchased of Trinity college the site of the ancient convent of Franciscans, or Gray friars. There are 10 fellowships.

SIDON (Hebr. Zidon, perhaps "fishing-place"), anciently, a city of Phenicia, situated on the e. coast of the Mediterranean, in lat. 33° 34' 5" n., 45 m. s. of Berytus. It was built on a rising mound, protected by the sea on the n. and w; while the bed of a river formed a natural fosse to the s., and the high hills shielded it to the e.; a double harbor gave shelter to its ships both in summer and winter. It soon rose, both by its exceptional position and the daring and enterprising character of its inhabitants, to the highest rank among the cities of Phenicia (q. v.), so that the whole country is sometimes designated by the name of Sidon, "the great," "the metropolis." The extensive commerce of Sidon is well known from ancient authorities. Its colonies extended over the coast of Asia Minor and the adjacent islands, the coast of Thrace and Eubœa, and even some parts of Sicily, Sardinia, Spain, the coast of Cornwall and the Baltic shores, the northern parts of Africa, and, in fact, nearly the whole of the ancient world. Their manufactures of glass and linen, purple dye and perfumes, were sources of unbounded wealth: and, whether they were the skillful workers, or merely the exporters and traders of those "divine" works in gold and silver, ivory and bronze, which were the marvel of both Greeks and Hebrews, so much seems certain, that they managed to be considered unanimously the most skillful workmen of their time. Although one of the cities assigned to the Israelites by Joshua, it never in reality belonged to them, but, on the contrary, was every now and then in arms against them, either singly, or in league with some of their deadliest enemies, and even subjugated them for a time. After being conquered itself by Tyre, the daughter-city, it attempted to throw off the

yoke at the invasion of Phœnicia by Shalmanezzer, to which king it surrendered. Under Assyrian, Chaldean, and Persian domination, it retained a kind of independence for its internal affairs, and under the Persians, actually reached its highest prosperity. But an unsuccessful revolt against that power, under Oechus, ended in its temporary ruin (351 B.C.). Speedily rebuilt and repeopled, it opened its gates to Alexander the Great (333 B.C.), and from that time forth it fell successively into the hands of Syrian, Greek, and Roman rulers. During part of the 17th and 18th centuries, it again became an important place of commerce; but misrule and violence put an end to its rising prosperity, and the number of its inhabitants has sunk to about 10,000. There is still some trade in silk, goatskins, oil rags, tobacco, and fruit. It is now called Saida, occupies a place somewhat to the w. of the ancient city, and belongs to the Turkish pashalic of Acre. In 1887, 22 sarcophagi of magnificent workmanship were discovered in the neighborhood. See PHœNICIA.

SIEBENBÜRGEN (Seven Castles), the German name of the Austrian principality of Transylvania (q.v.).

SIEBENGEIRGE, a collection of conical heights in Rhenish Prussia, on the right bank of the Rhine, about 22 m. above Cologne. The highest of the peaks is the Drachenfels (q.v.), 1065 ft. high.

SIEBOLD, KARL THEODOR ERNST VON, a distinguished physiologist and zoologist, b. in Würzburg, Feb. 16, 1804. He was educated at Göttingen and Berlin, became, in 1835, director of the lying-in-hospital at Dantsic, in 1840 professor of physiology at Erlangen, in 1845 at Freiburg, in 1850 at Breslau, and in 1853 professor of physiology and comparative anatomy, and later of zoology, at Munich. His researches in the field of *protozoa*, the development of *medusæ*, and natural history of tape-worms, are particularly valuable. His writings include: *Observationes de Salamandris et Tritonibus* (1828); *Lehrbuch der vergleichenden Anatomie der wirbellosen Tiere* (1848); *Über die Band- und Blasenwürmer* (1854); *Die Süßwasserfische von Mitteleuropa* (1863); and many others. Siebold died at Munich, April 7, 1885.

SIEBOLD, PHILIPP FRANZ VON, a noted German naturalist; b. in Würzburg, Feb. 17, 1796. After studying medicine and natural sciences at Würzburg, he went, in 1822, to Batavia as Dutch sanitary officer, and the following year to Japan, as attaché. In 1826 he was at Yeddo, but was forced to leave, owing to an infringement of court etiquette, and in 1830 returned to Holland. During the years 1859-62, he was again in Japan, after which he returned to his birthplace, and died in Munich, Oct. 18, 1866. His valuable collections in the fields of ethnography and natural history are preserved in the museum at Leyden. His published works include: *Nippon; Archiv zur Beschreibung von Japan* (1832-51); *Fauna Japonica* (1833-51); *Flora Japonica* (1835-70); *Bibliotheca Japonica* (1833-41); and many other works relating to Japan.

SIEDL'CE, a government in w. Russian Poland, bounded on the n.e. and e. by the Bug river; 5535 sq. m.; pop. '94, 752,152.

SIEGE (Fr. a seat, a sitting down) is the sitting of an army before a hostile town or fortress with the intention of capturing it. If a fortress of great strength has to be reduced, and if the force of the enemy in the vicinity has been either subdued or held in check by a covering army, the place is at once invested on all sides by rapid movements. This step constitutes merely a blockade; and if time be of little importance, is a sufficient operation, for hunger must sooner or later cause the fortress to surrender; but if more energetic measures are required, the actual siege must be prosecuted. Advantage is taken of any hidden ground to establish the park of artillery and the engineers' park; or if there be none, these parks have to be placed out of range. The besieging force is now encamped just beyond the reach of the guns of the fortress; and their object is to get over the intervening ground and into the works without being torn to pieces by the concentrated fire of the numerous pieces which the defenders can bring to bear on every part. With this view, the place is approached by a series of zigzag trenches so pointed that they cannot be enfiladed by any guns in the fortress. In order to accommodate the forces necessary to protect the workers, the trenches at certain intervals are cut laterally for a great length, partly encircling the place, and affording safe room for a large force with ample battering material. These are called *parallels*, and they are generally three in number. The distance of the first parallel will increase as small-arms become more deadly; but with the old smooth-bore muskets it was usual to break ground at 600 yards from the covered way of the fortress, while at Sevastopol ground was broken at 2,000 yards, and in the siege of Paris by the Germans the lines were begun at least 4 m. from the city. The locality of the parallel being decided on, a strong body of men is sent to the spot soon after nightfall. The attention of the garrison is distracted by false alarms in other directions. Half the men are armed cap-à-pie, and lie down before the proposed parallel; while the other half, bearing each pick and shovel, and two empty gabions, prepare for work. Each man deposits the gabions where the parapet of the trench should be. He then digs down behind them, filling the gabions with the earth dug out; and, after they are filled, throwing it over them, to widen and heighten the parapet. Before daylight the working-party is expected to have formed sufficient cover to conceal themselves and the troops protecting them. During the day, they—being concealed from the garrison—widen and complete their parallel, making it of dimensions sufficient to allow of wagons and bodies of troops with guns passing along. During the same night, other parties will have been at work at zigzags of approach from the depots

out of range to the first parallel, which zigzags will be probably not less than 1000 yards in length. As a rule the defenders will not expend ammunition on the first parallel, for

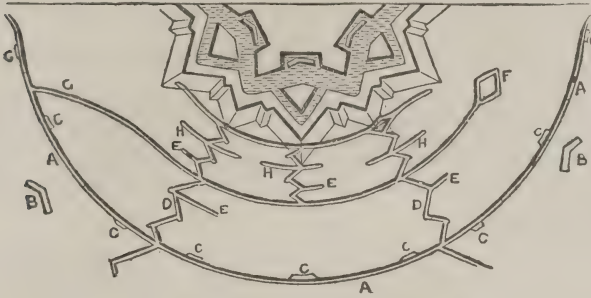


FIG. 1.—Siege Works.

bodies of cavalry, who are kept at hand to resist sorties from the garrison. The length of the parallel is usually made sufficient to embrace all the works of two bastions at least. Sites are then chosen for batteries, C,C, which are built up of fascines, gabions, sandbags, and earth. They are placed at points in the parallel formed by the prolongation of the several faces of the bastions, ravelins, and other works of the fortress, which faces the batteries are severally intended to enfilade by a ricochet fire. Other batteries will be formed for a vertical fire of mortars and shell-guns. By these means it is hoped that the traverses on the hostile ramparts will be destroyed, the guns dismounted, and the defenders dispersed, before the final approaches bring the assailants to the covered way. The sappers will now commence their advance toward the points, or salient angles, of the two bastions to be attacked. If, however, the trench were cut straight toward the fortress, its guns could easily destroy the workmen and enfilade the approach. To prevent this, it is cut in short zigzags—as at D—the direction always being to a point a few yards beyond the outmost flanking works of the garrison. The side of each trench nearest the fortress is protected by gabions and sandbags, as in the case of the parallel. At intervals, short spurs of trench, incipient parallels, are cut, as at E, to contain small-arms-men, to act as guards to the sappers. The second parallel is about 300 yards from the enemy's works and has to be more strongly formed than the first. It often terminates in a rebout, F, to hold some light artillery and a strong force of infantry, who could assail any sortie in flank; or it may run into the first parallel, as G, giving easier access for troops than through the zigzags. The second parallel is revetted with sandbags, in which loopholes are left for musketry. After passing the second parallel, the angles of the zigzags become more acute, to prevent enfilading. At about 150 yards, certain demi-parallel, H, are cut, and armed with howitzer batteries, to clear the covered-way, while riflemen also act from it. The third parallel is at the foot of the glacis. Thence the place, after being sufficiently battered, is taken by a storming-party, who make their way over the glacis, or the covered-way is topped by the double sap, which is a safer plan for the army generally, though much more deadly to the sappers. When the crest of the covered-way has thus been reached, batteries of heavy artillery will be there established, for the purpose of breaching the walls of the ravelin and bastion; while at the same time miners will first seek to destroy the defenders' counter-mines (which would otherwise be likely to send these batteries into the air), and then will excavate a tunnel to the ditch, at the foot of the counterscarp. If the branch becomes practicable, a storming-party will emerge from this tunnel or gallery, and seek to carry the opposite work by hard fighting. If inner works still subsist, which would tear assailants to pieces, the double sap may be continued across the ditch, if a dry ditch, right up the breach, that counter-batteries may be formed. If the ditch be wet, means must be adopted for a causeway or a bridge. By these means, however obstinate may be the defense, if the besieging force be sufficiently strong, and aid do not arrive from without, the ultimate success of the attack becomes certain. Vauban raised attack to a superiority above defense, first, by the introduction of ricochet fire, which sweeps a whole line; and secondly, by originating parallels. Before his time the whole attack was conducted by zigzag approaches; in which the troops actually in front could be but few, and were therefore unable to withstand strong sorties of the garrison, who, in consequence, frequently broke out and destroyed the works of the besiegers, rendering a siege an operation of a most uncertain character. During the civil war, the following important siege operations occurred: the investment of Yorktown by the army and Gen. McClellan, which occupied the month of April, 1862, the position being evacuated May 3; the siege of Charleston, S. C., which continued at intervals during the war, until its evacuation by the confederates in Feb., 1865, after the capture of Columbia by Gen. Sherman.

its extent (often several miles) will render the probability of doing material damage extremely small. For this reason also, the dimensions of the parapet and its solidity are of far less importance in the first parallel than in the more advanced works of attack. The first parallel, AAA, fig. 1, being completed, the engineers select points near its extremities, at which they erect breast-

the movement against, and siege of, Corinth, Miss., April 15–May 30, 1861; siege of Knoxville, Tenn., by Gen. Longstreet in Dec., 1861; siege of Atlanta, Ga., July 22–Sept. 1, 1864, by Gen. Sherman; operations against Vicksburg, May–July, 1863, by Gen. Grant, resulting in its surrender July 4; siege of Petersburg, Va., June, 1864–April, 1865.

SIEGE-ARTILLERY is heavy ordnance used for battering purposes, and of too weighty a character to take the field.

SIEGEN, a manufacturing t. of Prussia, in Westphalia, stands on the Sieg, 47 m. s.e. of Cologne. In 1895 it had 19,303 inhabitants, who are engaged in manufacturing leather, cotton, and woolen goods. Siegen is also said to produce the best iron in the w. of Germany. In the vicinity are numerous iron mines and smelting furnaces. Its iron and steel wares are noted. There are iron, copper, and sulphuret of lead and zinc mines in the vicinity.

SIEGFRIED. See **NIBELUNGENLIED**.

SIEMENS, ERNST WERNER VON, b. at Lenthe, near Hanover, in 1816. He was educated in the gymnasium of Lübeck and in the school of artillery and engineering of Berlin, and entered the Prussian army as an artillery officer in 1838. He studied chemistry and electro-magnetism, and invented a process for electro-plating in 1841. He was the first to explode a submarine mine by electricity (1848). After 1849 he was engaged in the establishment of telegraph lines, particularly through Russia, Brazil, Spain, and northern Germany. His researches in electricity resulted in discoveries and improvements of great value, one of which was the determining of the locations of injuries in submerged cables, and also of charging them in order to reduce the disturbing influence of induced currents. He d. in 1892.

SIEMENS, KARL WILHELM (Sir Charles William), physicist, brother of the preceding, b. at Lenthe, near Hanover, 1823. He was educated at Göttingen; went to London in 1843, and founded there in 1853 a branch of the Berlin establishment, making telegraph instruments at Woolwich, and having steel works at Landore in Wales. He was the author of numerous inventions, of which the principal are a process of "anastatic printing;" a chronometric governor for controlling the motion of astronomical instruments; a regenerator for recovering the heat emitted at the exhaust port of caloric engines; a water-meter extensively used in Europe; (in connection with his brother Frederick) a regenerating gas furnace for the production of high-quality steel, and a rotary furnace for making iron and steel direct from the ore. He was also connected with telegraph engineering, from 1848. He was author of *On a Regenerative Condenser* (1850); *On the Conversion of Heat into Mechanical Effects* (1853); *On a Regenerative Steam-Engine* (1856); and *On the Increase of Electrical Resistance in Conductors, with Rise of Temperature, and its application to the Measure of Ordinary and Furnace Temperature* (1871). He was D.C.L. of Oxford, a fellow of the Royal society, and a member of all the great technological and scientific bodies of England and the continent of Europe. He d. 1883.

SIENKIEWICZ, HENRYK. The greatest living Polish novelist, born in 1846, at Vola Orkzeiska, in Russian Poland, and educated at the university of Warsaw. In 1872 he published his first story, *No one is a Prophet in his own Country*, which was favorably received. Four years later he visited America and his American letters published in the Warsaw *Gazeta Polska*, under the pseudonym of "Litvos," were widely read. He has since written a long series of novels, which have given him an international reputation, and have been widely translated. The following have appeared in English: *With Fire and Sword*; *The Deluge*; *Pan Michael*; *Without Dogma*; *Quo Vadis?*; *Lillian Morris*, and other Stories; *Yanko the Musician*, and other Stories.

SIENNA, a city of central Italy, 60 m. s. of Florence by railway. Pop. '95, 29,800. It is situated on three little hills, separated from each other by three valleys, and higher than the other hills surrounding them. Its climate is on this account very salubrious, notwithstanding the deficiency of water caused by its elevated position; to remedy which, subterranean aqueducts had been excavated, 5 m. in length, some of them dating as far back as the Roman dominion. Its environs are not beautiful, consisting of naked clay hills, capped with sandstone, but the city is surrounded by trees and avenues, which have a fine effect. The handsome square, Piazza del Campo, is one of the finest in Italy. Eleven streets lead out of it, and it is surrounded by handsome buildings. In this square there is also the famous tower called the *Mangia*, 635 ft. high; there are also other towers here and there, seen from a great distance—remnants of the inhabitants of the feudal lords. The streets are narrow, some paved with tessellated bricks, and others flagged. There are many ancient Gothic palaces, not remarkably handsome. In the Piazza del Campo stands the Palazzo Pubblico, built in the 13th c., in which there are magnificent rooms, and paintings by eminent artists. Sienna has a fine cathedral, erected, it is said, on the foundations of the temple of Minerva, begun in 1059; the façade built in the 13th century. It is faced with red, black and white marble, and is covered with ornaments and sculptures. The pavement is of marble tessellated, representing many biblical subjects. In the different chapels, and in the baptistery, there are frescoes, paintings, and statues, by a number of distinguished

masters. The other churches are also rich in works of art. Many fine paintings are to be seen in the church of St. Augustine and other churches, and in many private palaces. Sienna is an archiepiscopal see. The Siennese are singularly industrious, and have numerous manufactories of cloth and woolen, silk and linen stuffs, of felt and straw hats, and of furniture. There are marble quarries in the neighborhood. There is a university, founded in 1321, famous especially as a school of medicine, which has upward of 100 students. The Italian spoken at Sienna is reckoned among the purest.

Sienna was founded as a Roman colony in the time of Julius Cæsar, under the name of Sena, or Sena Julia. There are no remains of antiquity; and it does not appear to have been a place of any consequence until the middle ages, when it became one of the powerful city republics of Italy. It embraced the Ghibelline cause, and in conjunction with the forces of Pisa, defeated the Tuscan Guelphs, in the memorable battle of Monte Aperto (1260). At the height of its greatness it is said to have contained 200,000 inhabitants. Sienna produced a "school" of artists, of whom the most distinguished names are Guido da Siena, Simone Memmi, Sodoma, Beccafumi, and Baldassare Peruzzi.

SIENNA EARTH. See BURNT SIENNA.

SIERRA, a name applied in Spain, and in countries in which the Spanish language has prevailed, to a ridge of mountains. The word means *saw*, and is descriptive of the notched or saw-like sky-line of certain mountain-ranges.

SIERRA, a co in n.e. California, adjoining Nevada on the e.; drained by the forks of the Yuba river; 900 sq.m.; pop. '90, 5051, chiefly of American birth; inclu. Chinese. The surface is mountainous, as the county lies among the peaks of the Sierra Nevada, of which some are from 6,000 to 8,000 ft. high. The climate is severe; and but a small part of the surface suited for agriculture. Gold is found in large quantities, and there are 6 quartz-mills. Co. seat, Downieville.

SIERRA LEONE (Mountain of the Lion), a British colonial settlement on the Sierra Leone coast, western Africa. The settlement consists chiefly of a peninsula, about 25 m. long, from n. to s., and 12 m. broad; but several islets, as the isles de Loss and the Banana islands belong to it. Area, according to latest returns, 15,000 sq.m.; population, '91, 180,000, but of Sierra Leone proper in that year, the population was reported to be 74,835, of whom 224 were whites, chiefly of English birth. In 1883 Great Britain annexed an additional strip of territory, extending from Sherboro to near the Liberian borders. Along the coast stretches a belt of rich low-lying land, and elsewhere in the colony there are fertile tracts; but the interior is a mass of rugged mountains, with a generally barren soil. The climate is humid and unhealthy—the wet season, lasting from May to November, being specially pestilential. Tropical fruits and plants grow luxuriantly in the more favorable regions, and coffee, sugar, indigo, and cotton have been introduced by the British. In 1895 the exports amounted to £452,604, the chief articles being gold, benni seed, ground-nuts, palm-oil, hides, palm-nuts, kola nuts, india-rubber and copal. In the same year the imports amounted to £427,337, and the chief articles were cotton goods (nearly one-half of the whole value), gunpowder, ready-made apparel, hardware, tobacco, and rum. The revenue in 1895 amounted to £97,851, and the expenditure to £96,690. The public debt of Sierra Leone (1895) was a loan of £50,000, payable 1896-98. The colony is ruled by a crown-appointed governor, assisted by a council. In 1866 Sierra Leone, the Gambia, the Gold Coast, and Lagos were placed under one general government, to be called the "government of the west African settlements."

The settlement of Sierra Leone was established in 1787, when 470 destitute negroes were removed to it from London by a body of philanthropists; and 1196 negroes were sent to it from Nova Scotia—the climate of which had proved too severe for them—in 1790. The population was also increased by other bands of people of color; and after the abolition of the slave trade in 1807, the slaves captured by British cruisers were put ashore, and settled here. In 1820 the settlement contained only 12,000 inhabitants, or less than a sixth of its present population. Capital, Freetown; pop. '91, 30,033.

SIERRA MA'DRÉ, a name given to central portions of the great chain of Cordilleras or Rocky mountains, in Mexico, from lat. 19° to 25° n., and in New Mexico, to the great western range, from lat. 34° to 38° north. These ranges, but partially explored, contain some of the richest silver mines in the world.

SIERRA MORENA, a mountain-range in Spain, on the southern border of New Castile, and between the modern provinces of Ciudad Real and Jaen. It separates the upper portions of the basins of the Guadiana on the n., and of the Guadalquivir on the s., and rises in its highest point to 5,500 ft. above the sea. It is frequently mentioned in *Don Quixote*, and is the scene of many of the incidents therein described.

SIERRA NEVA'DA (*Snowy Range*), a mountain range of Spain in Andalusia, extending e. from Padul, 12 m. s. of Granada, to the frontiers of the modern province of Almeria, is 75 m. in length, from 20 to 30 m. in breadth, and covers an area of upward of 1000 sq. miles. It is continued on the n.e. by the Sierra de la Filabras, and

forms a portion of the watershed between the streams that flow into the Mediterranean and those that flow into the Atlantic. The peak of Mulhacen reaches a height of 11,420 ft., and is the highest summit not only of the Spanish peninsula, but of the whole of Europe w. of the Alps. The peak of Veleta is 11,387 ft. high. The range receives its name from the perpetual snow which covers the highest summits.

SIERRA NEVADA, a range of mountains in California, forming a portion of its eastern boundary, is the source of a multitude of rivers, which swell the Sacramento and San Joaquin. The range extends from n.w. to s.e. 450 miles, and is united to the Coast range, which runs parallel with the Pacific, by mount San Bernardino. Among the higher peaks of the Sierra Nevada are mounts Whitney, 14,898 ft.: Brewer, 13,886; Lyell, 13,042; and Dana, 12,992. Here are immense deposits of gold quartz, with steam and water power crushing-mills; deep tunnels and mines, increasing with their depth their yearly product.

SIESTA is a Spanish word meaning literally "a sitting down," and is used in speaking of the rest taken within doors during the heat of the day.

SIEYÈS, EMMANUEL JOSEPH, Comte, who, as the abbé Sicypès, prominently figures in the history of the French revolution, was born at Fréjus, May 3, 1748. He was educated at the university of Paris with a view to his entering the church; and on the completion of his studies he obtained the appointment at Treguier, in Bretagne (1775), whence, in 1780 he was transferred to the cathedral of Chartres, of the diocese of which he became chancellor and vicar-general. He had early imbibed the extreme liberal opinions on all matters social and political which were preparing the French revolution; and when, in 1789, the states-general were summoned, he issued his famous pamphlet, entitled *Qu'est-ce que le Tiers État?* This work, which claimed for the people political recognition, naturally enough obtained an immense popularity for its author, and procured his election as one of the deputies for Paris. Mainly through his urgency and influence it was that, on June 16, 1789, the representatives of the people took the decisive step of constituting themselves into an independent body, and became the national assembly. Of this body he continued for some time to be one of the most prominent and leading figures. In 1791 he was elected to the legislative assembly, then convened, as member for the department of Paris. By this time, however, he had sunk somewhat from his first pre-eminence; bolder and fiercer spirits had passed him in the race for power and popularity, and where he had once led, he now reluctantly followed. In the convention of 1792, to which he was elected as deputy of the department of La Sarthe, he prudently refrained from any active participation in the debates, and on the occasion of the king's trial he recorded a silent vote. While Robespierre and his party were in power, he consulted his safety by retiring from Paris. When afterward asked what he had done during the reign of terror, he quietly replied: *J'ai vécu* ("I have lived"). On the fall of Robespierre he returned to his post in the convention, and resumed his active interest in affairs, becoming a member of the new committee of public safety. He was engaged chiefly in the department of foreign policy, and he went as ambassador to Holland and Berlin successively to negotiate treaties of alliance. He became a member of the directory in 1799, and among other reactionary measures, he succeeded in closing the celebrated Jacobin club. Perceiving that a stable government was on no other terms possible, he became anxious to secure the co-operation of some powerful military leader, the more particularly as he was ambitious above all things of giving France a "constitution" (of which he had drawn up one or several); and on the return of Bonaparte from Egypt, he entered into a league with him, the result of which was the revolution of the 18th Brumaire (Nov. 9, 1799), and the institution of the consulate. Sicypès, Napoleon, and Roger Ducos being the three first consuls. Speedily, however, Sicypès discovered in his new ally his master. As to the distribution of power in the new constitution to be formed, he and Napoleon differed irreconcilably; the man of bayonets was the stronger; his political nostrums never got beyond the paper on which they were written; and finally, in disgust at the subordinate position into which he found himself about to sink, Sicypès threw up his place in the government. As a reward of his services, he received on his retirement a sum of 600,000 francs and the estate of Crosne; afterward exchanged for the equivalent of a splendid hotel in Paris and the lands of Fainanderie, in the park of Versailles. Also the title of count was conferred upon him. Subsequently the presidency of the senate was offered him, but he declined it, and never afterward concerned himself in public affairs. Banished at the restoration, he did not return to France till after the revolution of 1830; and in Paris, on June 20, 1836, he died. During the revolution Sicypès drew up a good many papers of one kind and another; but he is chiefly remembered for his plan of a new constitution, which, however, is very little known. Mignet's *Histoire de la Révolution* contains a description of it; and under the title of *Théorie Constitutionnelle* of Sicypès, and *Constitution de l'An VIII.*, M. Boulay (de la Meurthe) published (Par., 1836) from Sicypès own *Mémoires Inédits* a more detailed account.

SIGEL, FRANZ, b. Zinsheim, Baden, 1824; educated at the military school at Carlsruhe; adjt. in the army of the grand-duke of Baden, 1847. Resigning his commis-

sion in the army he participated in the revolution of 1848, and was appointed minister of war by revolutionary leaders in the same year. He fought against the Prussians, carried the remnant of his forces into Switzerland, and, expelled from thence, took passage for this country, where he taught mathematics in Dr. Rudolph Dalon's academy in New York, and married his daughter. He joined the state militia; commissioned maj. of the 5th regiment. He was a professor in a college in St. Louis, Mo., 1858. At the beginning of the war against the South he entered the union army as col. of the 3d Missouri volunteers, assisting in the capture of Camp Jackson, at the battle of Carthage, and at Wilson's Creek second in command under Gen. Lyon. In charge of a brigade he went through the s. Missouri campaign; was prominent in the battle of Pea Ridge; resigned in 1862; accepted a commission as maj. gen. a month later, and was placed in command of Harper's Ferry. A few months after, he took command of Fremont's army corps, served through the Virginia campaign and the second battle of Bull Run; commanded the dept. of West Virginia, 1864, was register of New York city 1871, and was prominent in politics in 1876; U. S. pension agent for N. Y., 1886-9.

SIGHING, THE ACT OF, is nothing more than a very long-drawn inspiration, in which a larger quantity of air than usual is made to enter the lungs. This is continually taking place to a moderate degree, and Dr. Carpenter remarks that it particularly occurs when the attention is released, after having been fixed upon an object which has strongly excited it, and which has prevented our feeling the insufficiency of the ordinary movements of respiration. Hence this action is often a simple result of deficient aëration; while in other cases, as is universally known, it is excited by a depressed state of the feelings.

SIGHT, DEFECTS OF. Under this head we shall consider such affections of the eye-sight as are due to some known or unknown peculiarity of the optical apparatus (including the optic nerve) not dependent on disease—viz., *short-sight, long-sight, double vision, color-blindness, and night-blindness.*

Short-sight, near-sight, or myopia (derived from the Greek words *myo*, I close, *ops*, the eye), is often popularly confounded with dim or weak sight; but in reality short-sight applies exclusively to the *range* and not to the *power* of sight, and a short-sighted person may possess the acutest power of vision for near objects. In this affection the rays which ought to come to a focus upon the retina converge to a point more or less in front of it. The cause of this defect probably differs in different persons. It may arise from over-convexity of the cornea or the lens, from undue density or abundance of the humors of the eye, from elongation of the globe in its antero-posterior diameter, or from an imperfect power of the eye to adjust itself to objects at various distances. The distance at which objects are perceived most distinctly by the perfectly normal eye ranges from 16 to 20 in.; an eye which cannot perceive objects distinctly beyond 10 in. may fairly be regarded as short-sighted; and in extreme cases the point of distinct vision may be 3, 2, or even only 1 in. from the eye. Short-sight is frequently hereditary in families. As a general rule the inhabitants of towns are much more liable to it than persons living in the country, and students and literary men are the most liable of all. While in the foot-guards, consisting of nearly 10,000 men, "not half a dozen men have been discharged, nor have a dozen recruits been rejected on account of this imperfection, in a space of 20 years, in one college at Oxford no less than 32 short-sighted men (or *myopes*, as they are termed by some oculists) were met with out of 127" (Donders, *On the Accommodation and Refraction of the Eye*, Lond. 1864, p. 342). The frequency of this affection in the cultivated ranks points directly to its principal cause—tension of the eyes for near objects. The myopia depending, as Donders believes, upon prolongation of the visual axis, this eminent physiologist inquires: "How is this prolongation to be explained? Three factors may here come under observation: 1. Pressure of the muscles on the eye-ball in strong convergence of the visual axis; 2. Increased pressure of the fluids resulting from accumulation of blood in the eyes in the stooping position; 3. Congestive processes in the base of the eye, which, leading to softening give rise to extension of the membranes. That in increased pressure the extension occurs principally at the posterior pole is explained by the want of support from the muscles of the eye at that part. Now, in connection with the causes mentioned, the injurious effect of fine work is, by imperfect illumination, still more increased; for thus it is rendered necessary that the work be brought closer to the eyes, and that the stooping position of the head, particularly in reading and writing, is also increased. Hence it is that in schools where, by bad light, the pupils read bad print in the evening, or write with pale ink, the foundation of myopia is mainly laid. On the contrary, in watchmakers, although they sit the whole day with a magnifying-glass in one eye, we observe no development of myopia, undoubtedly because they fix their work only with one eye, and therefore converge but little, and because they usually avoid a very stooping position."—*Op. cit.* pp. 343, 344.

So far from short-sightedness improving in advanced life, as is popularly believed, it is too frequently a progressive affection; and every progressive myopia is threatening with respect to the future. "If," says Donders, "it continues progressive, the eye will soon, with troublesome symptoms, become less available, and not unfrequently, at the

age of 50 or 60, if not much earlier, the power of vision is irrevocably lost, whether through separation of the retina from the choroid, from effusion of blood, or from atrophy and degeneration of the yellow spot."

In the treatment of myopia the principal objects are: 1. To prevent its further development and the occurrence of secondary disturbances; and 2. By means of suitable glasses, to render the use of the myopic eye easier and safer.

1. To effect, if possible, the first object, the patient must look much at a distance, but as we cannot absolutely forbid him looking at near objects, spectacles must be provided which render vision distinct at from 16 to 18 inches. Moreover, it is desirable that at intervals of a half hour work should be discontinued for a couple of minutes, and no working in a stooping position should be permitted. The patient should read with the book in the hand, and in writing should use a high and sloping desk.

2. The optical remedy for short-sight obviously consists in concave glasses of a focus suited to the individual case. At first sight it might be supposed that glasses with a concavity exactly sufficient to neutralize the defect in the eye would always suffice; and when the glasses are used exclusively for distant vision (for example, in the double eye-glass, which is only at intervals held before the eye), or when the affection is slight, and the eye is otherwise healthy, perfect neutralization is admissible; but so many circumstances forbid the complete neutralization of the myopia that an oculist of reputation should always, if possible, be consulted as to the choice of spectacles. Glasses, if injudiciously selected, usually aggravate the evil they are intended to remedy; and in connection with this subject may be mentioned the prevalent habit in foreign countries, of employing a single eye-glass; it is most prejudicial to the eye which is left unemploied, and often leads to its permanent injury.

Long-sight and presbyopia (derived from the Greek words *presbys*, an aged person, and *ops*, the eye) are usually considered by English writers as synonymous terms. Donders, who is now universally accepted as the highest authority on this department of eye-affections, maintains that "the term presbyopia is to be restricted to the condition in which, as the result of the increase of years, the range of accommodation is diminished, and the vision of near objects is interfered with." As from youth up to extreme old age, the vision of near objects becomes progressively more and more difficult, it is impossible to fix any limit as the commencement of presbyopia. In practice, however, a word is required which indicates the condition in which the eye, at an advanced period of life, and sometimes sooner, requires convex spectacles for distinct near vision, as, for example, for reading, and this word is *presbyopia*. In this state, the nearest point of distinct binocular vision is found to lie about 8 in. (or double the ordinary distance) from the eye, and at this point Donders arbitrarily places the commencement of presbyopia. This condition, which is as natural a concomitant of advanced life as gray hairs or wrinkles, is occasionally met with in young persons. In these cases, it generally arises from intestinal irritation, and may be a precursor of amaurosis; hence such cases should be carefully watched. In ordinary presbyopia, the defect is at once remedied by the use of glasses of low convex power, as of 30 or 24 in. focus, which should, however, only be worn during reading and writing, and not constantly. Although the improper use of convex glasses is not by any means so dangerous as the inconsiderate use of concave glasses, the advice of a good oculist regarding the choice of spectacles is well worth his fee.

Double vision, or diplopia, is of two kinds. It may arise from a want of harmony in the movements of the two eyes, the vision of each eye singly being perfect; or there may be double vision with one eye only. The first form may occur (1) in cases of squinting, or (2) in cases of paralysis of one or more of the muscles of the orbit. In cases of squinting (q.v.), the vision of the most distorted eye is almost always imperfect; and it is well known that impressions on the two retinæ are similar in kinds but dissimilar in form. The mind takes cognizance only of the former; so that a person with a bad squint sees objects with the sound eye only. But if the sight of both eyes is nearly equal, as often is the case when the squint is not very well marked, double vision results whenever both eyes are employed together, in consequence of images of nearly equal intensity falling on non-corresponding parts of the two retinæ. This variety of double vision, although annoying, is perfectly harmless. When double vision arises from muscular paralysis, disease of the brain of a serious nature is to be apprehended, although the affection sometimes appears to arise from exposure to cold. The second form of double vision—viz., double vision with a single eye—is a much more rare affection than the preceding one, and depends upon some irregular refraction of the cornea or lens.

Color-blindness is noticed under its own name.

Night-blindness, or hemeralopia (from the Greek, signifying "day-sight"), is a peculiar form of intermittent blindness, the subjects of which see perfectly with an ordinary light, but become entirely and almost instantaneously blind as soon as twilight commences. It is seldom met with in this country except among sailors just returned from tropical regions. It is frequent among the natives of some parts of India, who attribute it, as our own sailors do, to sleeping exposed to the moonbeams. The most probable cause of the affection is, however, exhaustion of the power of the retina from over-excitement from excessive light, so that this organ is rendered incapable of appreciating the weaker stimulating action of twilight or moonlight. All that suggests itself in the

way of treatment is to protect the eyes from strong light during the day, and to prescribe quinine and a nourishing mixed diet.

Snow-blindness must be regarded as an allied affection to the preceding.

SIGHT OF A GUN. See GUNNERY.

SIGILLARIA, a genus of fossil plants which are of importance because of their singular structure, and their remarkable abundance in the coal measures. They seem to have contributed more than any other genus of plants to the formation of coal. The roots of sigillaria are found preserved in the shale which forms the floor of all coal-seams. These roots were originally supposed to be distinct plants, and have received the generic name of stigmaria. The most feasible notion, and that generally accepted regarding them, was that they were fleshy water-plants, with numerous linear leaves, articulated to the stem by papillae, which were buried in deep cylindrical hollows in the stem. Brongniart first suspected that they were roots, and Binney placed the question beyond doubt by discovering a specimen in which the trunk of a sigillaria rose from the crown of a stigmaria. Several observers have subsequently seen these fossils also in actual contact. It is believed that the mud (now converted into shale) in which they grew was very soft, and easily permitted the passage of the large roots, while they gave off all around innumerable large hollow rootlets. The stems of sigillaria are abundant in the coal-beds. They are marked by parallel longitudinal flutings, and regular scars formed by the base of the leaf-stalks, which had fallen off. They are known to have attained a height of 70 ft. and a diameter of 5 feet. The stem rose without branching till near the summit, when it branched several times dichotomously. The proportion of woody matter to cellular tissue in the stem was very small. The woody fiber is characterized by the abundance of scalariform vessels, similar to those which occur in *lepidodendron*, and in the recent vascular cryptogamia. The stem is seldom found preserved so as to exhibit any structure, or even its cylindrical form; it generally occurs as a double layer of coal, showing on the outer surfaces the scars produced by the bases of the leaf-stalks. The form and arrangement of these scars have been used to distinguish the species, and, indeed, no other materials exist, for hitherto no foliage of any kind has been certainly found connected with the trunks. The restoration of the genus has been consequently quite imaginary. Some, with Brongniart, have supposed that the trunk terminated in a crown of simple leaves, like that of many palms, and that it was a gymnosperm near to the cycads. Others, with King, consider that the fronds of *pecopteris nervosa*, which are very abundant in the coal measures, are its foliage, and they would restore it so as to have the appearance of a modern tree fern. And others, with Binney, consider that its affinities are nearer to *lepidodendron*, and that some of the numerous fragments which have been referred to this genus may really be the branches of the sigillaria. They would restore it as if it were a huge *lycopodium*, and refer to it some of those fruits which, under the names of *lepidostrobus* and *flemingites*, have been described by Brown, Hooker, and Carruthers. See illus., COAL AND ROCK SALT, vol. IV.

SIGISMUND, Emperor of Germany (1411-37), was the son of the emperor Karl IV. He was well educated, and having married Maria of Anjou, on her accession to the throne of Hungary he became chief administrator of that kingdom. The death of his wife in 1392 made him king of Hungary; and at the head of a numerous army of more than 100,000 men, composed of Hungarians, French, Germans, and Poles, he attempted to relieve the Byzantine empire from the fierce Turks, but was terribly defeated at Nicopolis (Sept. 28, 1396). On his return to Hungary, he found on the throne a new monarch, Ladislas of Naples, who imprisoned him (1401); but through the good offices of his elder brother, Wenceslas, he was freed, and obtained the throne (1402), rewarding his elder brother by snatching from him his kingdom of Bohemia, which he retained for some time. In 1411 he was proclaimed emperor, on the death of Rupert. He was present at the council of Constance, which he had prevailed upon pope John XXIII. to hold for the purpose of putting an end to the Hussite and other schisms. He contented himself with protesting against the violation of the imperial safe-conduct which was given to Huss, and ultimately consented to his judicial murder, for the purpose, as his apologists say, of conciliating the council, and so settling the disputes concerning the papacy. His succession to the throne of Bohemia, after his brother's death, was opposed by the Hussites, who were now in insurrection; and after a fruitless attempt to conquer them, he confined himself to the defense of Hungary against the Turks, whom he defeated in a great battle near Nissa (1419). For ten years afterward, he left Germany very much to the guidance of its self-willed petty rulers, who speedily brought the country into such a deplorable state that they were glad to beseech Sigismund to return to the helm of affairs—which he did, but with little good effect. He obtained, by concessions to the Calixtines (q.v.), the crown of Bohemia in 1436; but once on the throne, he gradually withdrew these concessions, which provoked such discontent that his death (1437) alone averted a civil war. Sigismund possessed a large intelligence, and remarkable political talents, but these were much neutralized by his impetuosity, indecision, selfishness, and extraordinary avarice; and his well-meaning endeavors after peace and improvement ended in nothing. Carlyle distinguishes Sigismund by the epithet *supra grammaticam*, in allusion to his answer to a cardinal at the council of Constance, who

ventured to correct his majesty's grammar—"I am the Roman king, and above grammar."

SIGISMUND, worthily surnamed the GREAT, King of Poland, was the youngest son of Casimir IV., and was born at Koziénicé, 1467. He was chosen grand duke of Lithuania, 1506, and succeeded to the kingdom of Poland on Dec. 8 of the same year. The affairs of Poland and Lithuania were at that time in a sad condition; the southern portions of the country reduced almost to a desert by the ravages of the Tartars, while the east was continually in dread of the Russians, who had become an independent, united, and powerful monarchy. The Russians invaded Lithuania, and conquered some provinces, but Sigismund gained a brilliant victory over them at Orsza on the Dnieper (July 14, 1508). Bogdan, prince of Moldavia and Wallachia, now invaded the southern provinces, as that semi-barbarous race were accustomed to do without let or hindrance; but he was so decisively routed on the banks of the Dniester, that he gladly agreed to acknowledge himself a vassal of Poland. Disregarding the suggestions of the pope to head a crusade against the Turks, Sigismund next read the Tartars, through his gen., Ostrogski, a very forcible lesson, in 1512, against aggressive practices, which cost them 27,000 men, and assured the tranquillity of his frontier for a long period. His alliance in 1513 with Stephen Zapoli, voyvode of Transylvania, whose daughter, Barbara, he also married, alarmed the emperor Maximilian, who incited the Russians to resume their aggressions, which that ill-advised nation cheerfully agreed to do; paying dearly for their rashness, for their army of 80,000, which had invaded Lithuania, was met and cut to pieces (Sept. 8, 1514) by Ostrogski, with 32,000 men, at Orsza, leaving its standards, cannons, and other arms, 2 generals, 37 princes, 6,000 prisoners, and 30,000 dead in the possession of the enemy. Subsequent invasions of Moscovites and Tartars were repelled as before, and a rebellion of the Wallachs was punished by numerous defeats, chief of which was that of Obertyn (1531). The insolence of the Teutonic order, who had invaded Polish Prussia, was effectually chastised by Sigismund, who defeated their grand master Albert, his own nephew, in two great battles, in the latter of which the knights were assisted by the Danes (1520). In 1525 he agreed to confer on Albert the title of duke of Prussia (now known as East Prussia), on condition of fealty and homage. The dukes of Prussia continued as vassals of the Polish crown till 1657. In 1526 Sigismund alone of the monarchs of Christendom lent aid to Hungary against the formidable array of Solymán the magnificent, and a numerous force of Polish cavaliers fought bravely on the fatal field of Mohacz (1526). The only other important event of Sigismund's reign was the introduction and extension of Lutheranism in Poland, a change which Sigismund did nothing to prevent, only taking precautions, and sometimes severe ones, against its affecting the civil and political condition of the country. It is told of him that, when John Eck exhorted him to take severe measures with the Lutherans, whom he compared to goats among the sheep ("the faithful Catholics"), Sigismund replied that he was desirous of being "king of goats as well as king of sheep." After a long and glorious reign, Sigismund died at Cracow, April 1, 1548, leaving the character of a just, wise, and magnanimous prince, who had restored to his country its ancient prosperity, and had raised it from the very feet of its enemies to a worthy superiority over them.

SIGMARINGEN. See HOHENZOLLERN.

SIGNALS are the means of transmitting intelligence to a greater or less distance by the agency of sight or hearing. Incomparably the most powerful medium yet known for this purpose is the electric current. See TELEGRAPH. Sound signals have obviously but a short circuit. The electric current requires fixed apparatus establishing an actual communication between the two points; and is therefore inapplicable to the ordinary cases of ships interchanging signals with each other or with the shore; and, except under unusual circumstances, it would not apply to armies maneuvering in the field. For these purposes, so far as present knowledge extends, signals by sight or sound must always be the resort. For railway signals, see RAILWAYS.

The ancients seem to have elaborated a fair system of night-signals by torches for military purposes; but in naval affairs the ships sailed so close together that orders could be communicated by word of mouth, while the turning of a shield from right to left sufficed as sailing directions to the several lines. In modern times signaling between ships has become indispensable; but there is probably no department of practical science in which progress has been slower, and every so-called system of signals has been distinctly without any system whatever. In the time of James II. a signal could only be expressed by flags, in confusing number, hung in different parts of the vessel. By the commencement of the present century, thanks to sir Home Popham and other inventors, the system had been adopted of hanging a number of flags under one another, each symbol or combination having an arbitrary conventional meaning attached to it. Alterations in the specific flags have been made from time to time, but essentially this is the system now in use. The flags are either square, triangular of the same length, or pendants which are pointed and longer. These are of black, white, red, blue, and yellow (in the Austrian service alone green is added) in mass or in combination. Specimens of the flags in use in the present naval code are shown in Fig. 1. The signalmen find, how-

ever, that at a distance blue, red, and black are

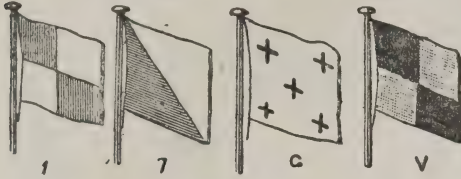


Fig. 1.

the case is otherwise on shore, and it may consequently occur that the ship can communicate to the land, but cannot get a reply. To obviate this signals representing solid figures are sometimes employed. To fulfill their conditions they must appear the same in whatever lateral direction seen. But this limits the shapes to cylinders, cones, and the sphere, or combinations of those figures; and as the total number of distinguishable signs is reduced, signaling becomes reduced from the word-signal to the telegraph. This distinction should be clearly understood, as much is involved in it. A word signal, as in the present system, is where the whole word or message is sent up at once, and flies simultaneously; a telegraph signal is one in which the letters composing the word or numbers representing the signal are shown separately, and each is removed before another is shown. At sea the word-system is best, for it involves no act of memory; and memory, even from signal to signal, is found difficult by signalmen in the turmoil of perhaps storm or fighting. On the other hand, the telegraph system involves far simpler apparatus, and the changes can be effected more rapidly. As regards the actual time required for a message, the word-system has the advantage in a message short enough for the whole to be shown at one time; but otherwise the difference is not material. If all advantages be balanced, it is probable that the telegraph system will eventually supersede the other entirely. Whether the word or the telegraph system be practiced, another question is, whether to spell each word, or to use numerals and a code. Under the latter principle about 14,000 of the words and sentences most commonly sent are arranged for easy reference in the signal-book. With the addition of 1 or 2 repeating symbols the 9 numerals and 0 give combinations 4 together to this number. A combination of figures is arbitrarily assigned to each expression; and the expression is communicated by representing those figures in their proper order. With the book of reference at hand, and intelligent signalmen, there can be no doubt of the superior rapidity of the "code." A code has also this further advantage, that, the signals representing things and not words, it can be made international, the same symbols representing the same idea in every language. It is then only necessary for universal signaling that each nation should concur in the meaning to be attached to the several signs. Many gentlemen of ability have devoted their attention of late years to the simplification of signals; among whom conspicuous positions must be assigned to Col. Grant, Col. Bolton, Mr. Redl, and Capt. Colomb, R.N. Their principal object has been so to simplify the telegraph system that signals may be made with any apparatus, or without apparatus at all. To accomplish this they have, to a great extent, abjured color and resorted to form and motion. Among the form telegraphs there is the principle of the old semaphore (q. v.), in which each letter or number is shown by the position of two arms, as in Fig. 2. The arms are heavy, and involve mechanism; besides which they are not always clear on a ship in motion beyond a short distance. Very superior in visibility and simplicity is Redl's system of cones. This consists of 4 cones fixed to a mast. The cones are collapsible, and are formed in a similar manner to umbrellas. Their usual condition is shut, and they can only be held open while a rope attached to each is pulled. With cones of 3 ft. base, signaling is rapid and clear up to 5 m., and the mast can be inserted at any place. The system is very simple: each cone represents a number, 1, 2, 3, or 4; then 1 and 4 shown represent 5; 2 and 4, 6; and so on, as in Fig. 3. This very elegant system can be applied in military or naval operations. But its chief beauty is that a person understanding it can make the same signals without the cones; for example, if a black flag represent an open cone, and a white flag a shut cone, a ship with 4 black and 3 white flags can make every signal. Again, the arm raised horizontally may represent the open cone; against the body, the shut cone; then two men standing on a cliff are as good as any signal-post—see Fig. 4. Or if one person only be present, he may represent an open cone by raising his arm with a handkerchief extended, and a shut cone by his arm without the handkerchief. He has only then to raise his arm four times in quick succession, with or without the handkerchief, to make the required signal. We have thus arrived at a universal system of the utmost simplicity, which in war, and especially during invasion, might be of inestimable benefit to the nation. The code of signals cannot be too generally diffused by the government, in order that every man among the

not readily distinguishable, nor yellow from white. It has consequently been the recent tendency, and apparently most justly, to reduce all the signs to black and white, singly or in combination, trusting to shape for different signals.

There are, however, disadvantages attending flags. In a still day they are difficult to read; or the wind may so blow that they are only seen end on. At sea the motion of a ship will generally neutralize these drawbacks; but

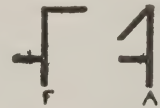


Fig. 2.—Semaphore Sytem.

public may become an amateur signalman on emergency. A secret code, in which the same numbers have different significations, could always be maintained for state purposes.

It only remains to apply the same system to night-signals. The old naval principle has been to hang dingy lanterns in various shapes—triangles, squares, crosses, etc. Besides requiring large bases to be at all visible, this has been found from the motion of a ship to be nearly useless. Redl's system has been applied by hanging four lanterns in



FIG. 3.—Cone System.



FIG. 4.

a vertical line to represent the cones, and obscuring those which corresponded to shut cones. An improvement was found in introducing a red or green light in the middle, to show the relative position of the four. The best night-signals are, however, flashing lights, as introduced by Col. Bolton, and more elaborately by Capt. Colomb, and adopted in the navy. This consists of a bright light, covered by a shade, which shade, by mechanism, can be lifted for any given time, exposing the light meanwhile. A flash of about half a second's duration is negative: a line of $1\frac{1}{2}$ seconds, positive. Four exhibitions of the light then represent a symbol as in Redl's cones. If the same nomenclature be adopted we should signal as in Fig. 5. It will be seen at once that this system produces results similar to Morse's electric telegraph. If the distance be within a mile or so, and the weather still, a bugle will answer equally well, long and short notes representing the positive and negative cones.



FIG. 5.

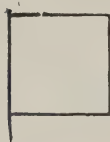
The fundamental principle of the foregoing system of universal telegraphy, applicable by night or by day, by sight or by sound, is to employ two signals only—one positive and one negative—and to regulate their exhibition by periods of time. See HELIOGRAPHY.

SIGNALS, AUTOMATIC RAILWAY. Various appliances have been invented for signaling the movement of trains and the position of switches. The Ducousso brothers have an invention, which gives notice of the passing of a train along certain parts of the line. The transmitter is a magneto-electric generator of induction currents, and the passage of a train induces a current which rings a bell at the receiving station. Another invention, by Coupan, signals the station man, if the lights at the switches are not burning and in proper position. When switches are moved by levers in a tower, at some distance from the place of the switch, they may not always respond to the movement of the lever; Lartigue has invented a signal for notifying the switchman if the switch does not respond. All signals, to be of value, must be given far enough ahead of the danger spot to stop the train. In the block system when a train enters a section, it sets a danger signal, and resets it at safety when leaving the section. Automatic signals are connected with switches, so as to set a danger signal when the switch is open, and by the passage of a current they may be made to give notice of a broken rail.

SIGNAL SERVICE OF THE UNITED STATES. At the time of the organization of the department of meteorology of the army signal office (see METEOROLOGY) there was no general system in operation for "simultaneous meteorology," and the one ever since in use was devised and carried into effect by Gen. Myer (q.v.), chief signal officer. By this system the innovation was introduced of observing and reading off the instruments, "at the same moment of actual (not local) time." By this arrangement the signal office at Washington can call for and receive reports from all parts of the country, taken at each of the stations, at any hour of the day or night. Thus, the exact condition of the atmosphere over the whole field of inquiry is set down at a given instant, establishing the existence of conditions on which predictions may be and are fearlessly made. In Nov., 1871, a comparison of the tri-daily forecasts, or "probabilities," as they were styled, showed a verification of 69 per cent, which rose to 76.8 per cent by 1872. These results "afforded the best elucidation and the most complete demonstration of the law of storms and the movements of cyclones that had ever been obtained in any country." In 1872 and 1873 the expansion of the work of the signal office was very great; extending, through the cordial aid of agricultural societies, into a comprehensive weather-bureau sustained in the interest of agriculture; and, through its connection with life-

saving and signal stations, becoming a most certain and effective agent for saving life and property endangered by storms on the sea. "Indication" and "cautionary signals," based upon three series of simultaneous weather-reports telegraphed to Washington daily, are issued from the office of the chief signal officer three times each day, and are printed in all newspapers where it may be important to do so, and otherwise made public. The preparation of a graphic weather-map embodying the telegraphic data furnished to the chief signal officer every eight hours, preserves an accurate picture of existing aerial phenomena, and the conditions on which storm predictions are made. The "Farmers' Bulletins" are reprinted by signal-service observers in 19 cities, and the telegraphic forecasts are circulated among 6,042 sub-centers in agricultural communities, and thence distributed among the farmers. As the predictions cover twenty-four hours, and often hold good for twice that period, they reach the denser rural populations sometimes a day and a half and always as much as fourteen hours before the period to which they apply expires. The railroad system has co-operated in this service, and 103 railway companies distribute daily 3,180 reports to as many railway stations, without charge.

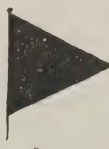
On March 1, 1887, a new system of weather signals was introduced by the United States Signal Office of the War Department, and has since been in use at all the stations of the service. The flags adopted for this purpose are four in number, and of the form and dimensions indicated below:

No. 1.
White Flag.

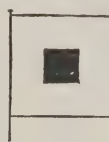
Clear or fair weather.

No. 2.
Blue Flag.

Rain or snow.

No. 3.
Black Triangular Flag.

Temperature signal.

No. 4.
White Flag with black square in centre.

Cold wave.

Number 1, white flag, six feet square, indicates clear or fair weather. Number 2, blue flag, six feet square, indicates rain or snow. Number 3, black triangular flag, four feet at the base and six feet in length, always refers to temperature; when placed above numbers 1 or 2 it indicates warmer weather; when placed below numbers 1 or 2 it indicates colder weather; when not displayed, the indications are that the temperature will remain stationary, or that the change in temperature will not vary more than 4° from the temperature of the same hour of the preceding day, from March to October inclusive, and not more than 6° for the remaining months of the year. Number 4, white flag, six feet square, with black square in centre, indicates the approach of a *sudden and decided* fall in temperature. This signal is not to be displayed unless it is expected that the temperature will fall to 42° or lower, and is usually ordered at least twenty-four hours in advance of the cold wave. When Number 4 is displayed, Number 3 is always omitted.

EXAMPLE.



Cold wave,
followed by
rain or snow,
succeeded by
fair weather.

When displayed on poles, the signals are arranged to read downward; when displayed from horizontal supports, a small streamer is attached to indicate the point from which the signals are to be read.

INTERPRETATION OF DISPLAYS.

- No. 1, alone, indicates fair weather, stationary temperature.
- No. 2, alone, indicates rain or snow, stationary temperature.
- No. 1, with No. 3 below it, indicates fair weather, colder.
- No. 2, with No. 3 above it, indicates warmer weather, rain or snow.
- No. 1, with No. 4 below it, indicates fair weather, cold wave.
- No. 3, with Nos. 1 and 2 below it, indicates warmer, fair weather, followed by rain or snow.

EXAMPLE.



Warmer,
fair weather,
followed by
rain or snow.

STORM, CAUTIONARY, AND WIND-DIRECTION SIGNALS.

Red, Black Centre. Yellow, White Centre.



Storm.



Cautionary.

Red Pennant.



Easterly winds.

White Pennant.

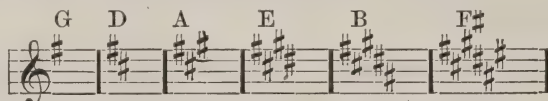


Westerly winds.

A red flag with a black centre indicates that the storm is expected to be of marked violence. A yellow flag with a white centre indicates that the winds expected will not be so severe, but well-found, seaworthy vessels can meet them without danger. The red pennant indicates easterly winds; that is, from the northeast to *south* inclusive, and that generally the storm-centre is approaching. If *above* cautionary or storm-signal, winds from northeast quadrant are more probable; *below*, winds from southeast quadrant. The white pennant indicates westerly winds; that is, from *north* to southwest inclusive, and that generally the storm centre has passed. If *above* cautionary or storm signal, winds from northwest quadrant are more probable; if *below*, winds from south-west quadrant. By night a red light will indicate easterly winds, and a white light above a red light will indicate westerly winds. In July, 1891, the Signal Service passed under the control of the Department of Agriculture.

SIGNATURE, in music. In writing music in any key with sharps or flats, the sharps and flats belonging to the key, instead of being prefixed to each note as required, are placed together immediately after the clef on the degrees of the staff to which they belong; and this collection of sharps or flats is called the signature. The signatures of the several keys generally in use are as follows:

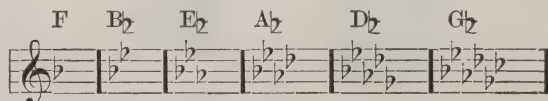
MAJOR.



MINOR.

E B F# C# G# D#

MAJOR.



MINOR.

D G C F Bb Eb

The minor keys take the same signature with the major keys a third above them.

When a new key is introduced in the middle of a piece of music, the signature of the former key must be contradicted, and that of the new one appended. Thus a transition

from the key of D major to that of D minor is indicated thus: ; from B

major to B minor: ; the sharps which are to continue being, in this

last case, for distinctness' sake, appended in addition to the contradiction of those that are to be discarded. A transition to another key, which is not to continue for any length of time, is seldom indicated by a change of signature; but the sharp, flat, or natural sign is appended to any note as required, that sign affecting all the following notes of the same letter in the measure in which it occurs, unless contradicted. A sharp, flat, or natural thus introduced is called an accidental. Two accidentals are required in the ascending scale of every minor key, to sharpen the sixth and seventh of the tonic.

Besides the signature of the key, a signature of time precedes every musical composition. It consists of two figures placed over one another as a fraction, the denominator 2, 4, 8, or 16 standing for minims, crotchets, quavers, or semiquavers (i.e., halves, fourths, etc., of a semibreve), while the numerator points out how many of these fractional parts

of a semibreve are contained in each measure. Thus, $\frac{2}{4}$ indicates that there are two

crotchets, and $\frac{3}{8}$ three quavers in the measure. When there are four crotchets (or

a semibreve) in the measure, it is usual to write $\frac{4}{4}$ instead of $\frac{4}{4}$.

SIGNATURE, in printing, denotes the letters which are placed at the bottom of the first page of each sheet of a book, to facilitate the arrangement of the several sheets in the volume. The letters employed are those of the alphabet with the exception of J, V, and W, three letters which have been invented since the use of signatures was introduced. See ALPHABET. As the first sheet of a work, containing the title-page, dedication, preface, etc., is generally printed last, the letter A is reserved (along with small letters, a, b, etc., should there be more sheets of introductory matter) for this, and the signatures commence with B; after reaching Z they commence again at the beginning of the alphabet, the letter being doubled for the sake of distinction, as AA, or Aa, or more frequently 2A. Should the alphabet again be exhausted, 3A, 3B, etc., are next employed, and so on. This is the method employed in Britain; in France and

Italy, figures are generally used. Signatures (as B2, B3, etc.) are also placed on certain pages of the same sheet, as a further direction to the book-binder.

SIGNET, in England, one of the seals for the authentication of royal grants. Prior to 1848 all letters-patent and other documents which had to pass the privy seal required first to have the signet affixed, and passed from the signet-office to the office of the privy seal in the form of signet bills, verified by the signet-seal and superscription and the signature of the clerk of the signet. By act 11 and 12 Vict. c. 82, however, warrants under the royal sign-manual, countersigned by one of the principal secretaries of state, have been made *per se* sufficient authority for the privy seal to be affixed, and the signet-office has been abolished. The signet in Scotland is a seal which seems to have been originally intended to authenticate royal warrants connected with the administration of justice. The principal class of agents or attorneys in Scotland are called writers to the signet, it is said from their having been originally clerks in the office of the secretary of state, by whom writs passing the signet were prepared. See **WRITERS TO THE SIGNET**.

SIGNING, SEALING, and DELIVERY of a deed, in English law, is the mode of executing a deed. The main acts are, however, the sealing and delivery, for signature is not absolutely essential—at least in some kinds of deeds known to English law. The use of the seal is an ancient form of authenticating deeds, still kept up in England, though long superseded in Scotland by simple subscription. In practice, a wafer or seal is attached to the end of the English deed, and the party who executes it must, after signature, put his finger on the seal, and say: "I deliver this as my act and deed," at the same time handing the deed to the person who is to have the custody thereof.

SIGN-MANUAL, ROYAL, the subscription of the sovereign, which must be adhibited to all writs which have to pass the privy seal or great seal. When attached to a grant or warrant, it must be countersigned by one of the principal secretaries of state, or by the lords of the treasury. The sign-manual, in practice, consists but of the initial of the sovereign's name, with the letter R added, for *Rex* or *Regina*.

SIGOURNEY, MRS. LYDIA HUNTLEY (Huntley being her maiden name), American authoress and poet, was b. at Norwich, Conn., in 1791. She was, like most young ladies of ability in New England at that period, early engaged in teaching, and much of her early writings consist of tales, essays, instructive letters, and poems, for her pupils and the young. Her first published work was a volume of poems in 1815. In 1819 she was married to Mr. Charles Sigourney, a merchant of Hartford. In 1822 she published a descriptive poem on the *Traits of the Aborigines of America*; and in 1824 a *Sketch of Connecticut Forty Years Since*. These were followed by *Pocahontas and other Poems*; *Lays of the Heart*, *Tales in Prose and Verse*, etc. In 1840 Mrs. Sigourney visited Europe, and on her return, with a freedom common to American authors, wrote her *Pleasant Memories of Pleasant Lands*. She compiled amusing and instructive books for the young, and was a constant contributor to magazines and other periodicals of poems, whose subjects, style, and sentiment gave her the designation of "the American Hemans." She died at Hartford, June, 1865.

SIHUN. See JAXARTES.

SIKHS. The term Sikh, a corruption of the Sanskrit *śiṣya*, signifying "disciple," is applied to a community of which the Punjab, in northern India, constitutes, substantially, the confines. Less commonly, even among themselves, the members of this community are also known as Sinhs (vulgarly Singhs), that is, "lions," a title given them by Govind, the last and most influential of their hierarchs. Every name of a Sikh male now terminates with the word Sinh.

Originally a body of mere religionists, the Sikhs, what from the energy which they developed under repression, and the inducements to join them which they offered as proselytizers, grew, by degrees, in strength and numbers, and ended in a formidable nationality. Their originator, Nānak, was born in 1469, in the vicinity of Lahore, and died in 1539, not far from the place of his nativity. To him succeeded, in turn, nine pontiffs, each of whom, like himself, is popularly denominated guru, or "teacher." These were Angad, Amardās, Rāmdās, Arjunmall, Hargovind, Harrāy, Harkrishna, Teghbahādar, and, finally, Govind.

The aim of Nānak was pointedly humanitarian, and designed to combine Hindus and Mohammedans, at the cost of what he held to be only unimportant compromise, into one harmonious brotherhood. Sufficient proof of the comprehensive character of his scheme is afforded by the circumstance that he accepted concurrently the incarnations of Neo-Brahmanism and the mission of the Arabian prophet. His three immediate successors, while zealously protecting the interests of the infant sect, avoided secular pursuits, and held themselves aloof from political complications. Arjunmall, however, not content with signalizing himself as compiler of the *Adigranth*, and as founder of Amritsar, the holy city of the Sikhs, engaged with ardor in trade, and rendered himself conspicuous as a partisan of the rebellious prince Khusrū, son of Jahāngir. Hargovind, who came after Arjunmall, called the Sikhs to arms, led them in person to battle, and though he remitted nothing of his assiduity as a guru, became an active and useful, though sometimes refractory, adherent of the Great Mogul, against whom his predecessor had plotted. Harrāy subsequently espoused the part of Dārā Shukoh, when con-

tending with his brothers for the throne of India. Harkrishna, son of Harrây, died a child, and was only nominally a guru. Teghbahâdar, after a career of turbulence, was executed as a rebel, by command of Aurangzeb, at Delhi. However deficient in the qualifications demanded for spiritual leadership, it can scarcely be doubted that he contributed, to an important degree, in preparing for the complete change of Sikhism which was affected by his son, Govind. The chief motive that instigated Govind, the tenth of the "teachers," to bring about this change was, with some probability, a desire to avenge the ignominious death of his father. He resolved to combat the Mohammedan power and, in deviation from the principles enunciated by Nānak, the Mohammedan religion as well. But Hinduism, with its social restrictions of caste, its fantastic fictions, and its irrational idolatry, likewise fell under his ban. God, he inculcated, is not to be found save in humility and sincerity. In what measure he was a man of thought is evinced by his legacy to his co-religionists, the second volume of the Sikh scriptures. A Sikh, it is therein taught, is to worship one God, to eschew superstition, and to practice strict morality, but equally is to live by the sword. The purport of this last injunction is unmistakable. Govind was assassinated, while in the imperial service, in 1708, on the banks of the Godāvari. He died, it is true, without beholding the fulfillment of the purpose for which he had striven; but he had, nevertheless, succeeded in stirring his followers to an ambition for political independence—an idea which was ultimately transformed into a reality. His successor, but only as a temporal leader, Banda, suffered a cruel death. He did but little to advantage his sect; and his memory is not held in reverence.

With the decline of the Moghul empire, the might of the Sikhs, in spite of their intermittent reverses, steadily increased, until, in 1764, they convened a general assembly, formally assumed the character of a substantive nation, and issued coin from which the name of the emperor was omitted. Their commonwealth was still denominated, as it had been by Govind, Khālsa; and the component states of the federation, ordinarily said to have been twelve in number, were thenceforward distinguished as Mislis. Foremost in influence among these states was that of Sukarchakīyā, the chieftain of which was Mahā Sinh, for whose son, the famous Ranjit Sinh (Runjeet-Singh, q.v.), it was reserved to consolidate the Mislis into a unity subject to his own undivided control. The virtual headship of Ranjit Sinh dates from the year 1805, though it was not until 1838 that he attained the zenith of his ascendancy. He died in the year following, at the age of 59. During 1845 and 1846 the Sikhs ceased to exist as a nation; and their country has since been ruled by the English. Yet every loyal Sikh is still confident that his people is suffering but a transitory depression, and that it is destined to retrieve, and even to surpass, its bygone glory. In the meantime, the reputed son of a wife or concubine of Ranjit Sinh, Dilip Sinh, is a pensioner of the British government, has professed Christianity, and has taken up his abode in England.

Ethnologically considered, the Sikhs are, in large proportion, of Jât origin; the Jâts, whom some take to be one with the classical Getae, being a tribe extensively diffused over the n. of India. But other Hindus have helped to swell their ranks, and also not a few Mohammedans. The ten gurus are accounted Kshatriyas, or of the second Brahmanical caste, the martial. The descendants of these several races, from intermarriage and other causes, cannot, however, now be discriminated; and there is no division of the multimorph population of India that strikes more than the Sikhs, as respects physical uniformity. For symmetry and comeliness, and, it may be added, for courage and powers of endurance, the Lions of the Punjab are altogether remarkable.

Nānak's was, undoubtedly, by far the most successful of the repeated attempts which have been made to fuse together the incompatible dogmas of Hinduism and Islamism. None of the authors of these attempts seem, indeed, to have been acquainted with other than the mere surface of the two religions which they would have blended into one. With the Mohammedan, the existence of the Deity as a pure spirit, and his creatorship of the world, are fundamental postulates. On the other hand, the radical doctrine of the Hindu is pantheism, agreeably to which the universe, alternatively God, is a single eternal substance, under the twofold aspect of spirit and matter. These sets of first principles, which Nānak and his fellow-reformers could never have clearly apprehended, are palpably impossible of reconciliation. Without rejecting all that is distinctive of his creed, no Hindu can assent to the theology of Islam; and, conversely, every intelligent follower of the Arabian prophet must be aware that the monism and metempsychosis of Brahmanism are utterly antagonistic to the leading positions of his own faith. Govind, as we have seen, openly repudiated the notion of amalgamating Hinduism and Mohammedanism. An opportunity of becoming acquainted with his real views and those of Nānak in their fullness has been provided for English readers by Dr. Trumpp's translation (London, 1877) of the *Adigranth* (the Original Record). The *Granth* contains also extensive quotations from Kubir and other predecessors of Nānak. A second *Granth*, by Guru Govind Sinh, has not yet been translated. These voluminous compositions are metrical throughout, and are in an archaic Indian vernacular, older than Hindi and Panjabi. They are written in the same character as the Sanskrit, the values of the letters being altered, though their forms are retained.

Among the numerous divisions into which Sikhism, as a system of belief and practice, has ramified, two at least, apart from the great central sect, deserve specification.

First are the Udâsis, professors of indifference to mundane concerns; a sect whose origin is attributed to S'richand, a son of Nānak. These recluses, whom Amardās refused to recognize as genuine Sikhs, have, to this day, numerous disciples. The Akālīs sprang up just after the time of Govind. For extravagance of fanaticism, these Ishmaelites have, it is hoped, no rivals; and the style of their piety is comparable with that of a Thug.

As specimens of the superstitions of the Sikhs, it may be noted that, like the Hindus, they look upon the eating of beef as a deadly offense, and that, like the modern followers of Zoroaster, they attach sinfulness to the act of extinguishing a light with the breath. Some illustrations of practical Sikhism may also be gathered even from the few remarks that have been made touching the gurus. It is not irrelevant to add, that Amardās humanely discountenanced the cremation of widows, and that Arjunmall committed suicide. The morality of ordinary Sikhs is as positively maintained by one class of writers as it is denied by another. Evidence should seem to show that the agriculturists among them are much on a par, as to correctness of life, with other Indian cultivators of the soil. As to their soldiers, however, it has been observed that they are deeply tainted with those repulsive impurities for which the Persians are so infamous. Though forbidden the use of tobacco, they are under no restriction as concerns indulgence in bhang, opium, and intoxicating drinks; and it would be gross flattery to commend them on the score of sobriety. As regards morality, there is reason to believe that they have greatly degenerated since the days of Govind.

The gross Sikh population has been most variously estimated by different statisticians, some of whom compute it at considerably less than half a million of persons, while others deem a million and a quarter, or even a million and a half, to be not excessive.

For the most satisfactory extant treatment of the subject of this article, the reader is referred to Capt. J. D. Cunningham's *History of the Sikhs*. Sir J. Malcolm's *Sketch of the Sikhs; The Asiatic Researches*, vols. i. and xi.; the collective works of prof. H. H. Wilson, vols. i. and ii.; and *The Calcutta Review*, vols. xxxi. and xxxiii., may likewise be consulted with advantage. See Trumpp's *Die Religion der Sikhs* (1881).

SIKH WARS, two brief but desperate contests waged between the British power in India and the Sikhs in 1845-46, 1848-49, which resulted in the destruction of the latter as an independent nation. The first had its origin in the dissensions which convulsed the Sikh country after the death of Runjeet Singh (q.v.), and which necessitated the exercise of a wary regard on the part of the Calcutta authorities. At length an army of Sikhs, flushed with their triumph over all lawful authority in their own country, crossed the Sutlej, and extended their ravages over British territory; but their advanced guard was met by sir Henry Hardinge, the governor-general, at the head of four regiments of infantry and one of dragoons, and routed at Mudki (q.v.) with heavy loss. Three days after, their main body, which had meantime crossed the river, and intrenched itself at Feroze-Shah (q.v.), was attacked by a larger force of British under Gough and Hardinge, and after a bloody conflict, which lasted two days, also routed. Still undismayed by these reverses, they again intrenched themselves at Sobraon; but a fresh body which had just crossed the Sutlej at Aliwal (q.v.), 19,000 strong, with 68 pieces of cannon, was wholly routed and driven across the river by sir Harry Smith, at the head of 7,000 men, with 32 guns; and their main body was soon after similarly dispersed at Sobraon (q.v.). The British then crossed the river, took Lahore, and restored the authority of the young maharajah, from whom they took the territory between the Beas and the Sutlej, the treaty confirming this settlement being made at Lahore, Mar. 9, 1846. But the internal disturbances in the kingdom of Lahore soon became as active as before, and induced the maharajah's prime-minister to put the country under the company's protection; and a residency with a guard of regular troops was then established in the capital. On April 20, 1848, two British officers were murdered by a Sikh chief, the Dewan Moolraj of Multan; and as this was found to be but a premonitory symptom of a general outbreak, a small force of British under lieut. Edwardes, aided by a body of Sikhs, under the rajah of Bhawalpur, gallantly attacked the army of Moolraj, which, after a desperate conflict of 9 hours, they defeated on June 18, and both sides in the mean time having received re-enforcements, again on July 1. Multan was then laid siege to, but the defection of 5,000 auxiliary Sikhs under Shere Singh (the son of the Sirdar Chuttur Singh, the governor of Hazara, who had been for some time in revolt, and had driven the British from his district) compelled the British to retreat. For some time the British authorities in the Punjab were hampered by a want of military force, and though the maharajah and much of his army still opposed the Sikh rebels, little reliance could be placed upon most of it. Shere Singh now succeeded in raising his army to 40,000, but was defeated by lord Gough at Ramnugger (Nov. 22). The inconsiderate haste of Gough at Chillianwalla (Jan. 13) nearly lost him that great battle, which was saved only by the extreme valor of his soldiers; but amends for this fault was made at Guzerat (q.v.), where the power of Shere Singh and his allies was completely broken. Meanwhile, the fortress of Multan had, after a protracted bombardment, been captured; and the Company, seeing no other mode of protecting their territories from annoyance by these warlike, fanatics, annexed the Punjab, Mar. 29, 1849, thus terminating the existence of the Sikhs as an independent nation.

SI-KIANG', or **WESTERN RIVER**, a river at the southern extremity of China proper. It has lately been ascertained by our surveyors to be navigable for vessels not drawing more than 16 ft. of water for about 100 m. from its mouth. The Si-kiang is remarkable for the purity and clearness of its waters. It is at present chiefly useful in conveying the sugar-cane that grows in its vicinity, as well as rafts of timber from the forests of Kwangse to the markets of Canton.

SIK KIM, a small protected state in the n.e. of India, bounded on the w. by Nepaul, and on the s.e. by Bhotan. Area, 2600 sq.m.; pop. '91, 30,458.

SILENÉ, a genus of plants of the natural order *caryophyllaceæ*; with a tubular 5-toothed calyx; 5-notched or bifid petals, which terminate in a narrow claw at the base, spring from the stalk of the germen, and have each an appendage forming a *corona* (q.v.) in the mouth of the corolla; 10 stamens; 3 styles; the capsule 3-celled, 6-toothed, many-seeded. The species are numerous, mostly natives of the temperate parts of the northern hemisphere, annual and perennial plants; nine or ten of them natives of Britain, and others frequent in flower-gardens.—One of the most common British species is the **BLADDER CAMPION** (*S. inflata*), a perennial, which grows in corn-fields and dry pastures, and near the sea-shore, has a branched stem fully a foot high, ovate-lanceolate bluish-green leaves, panicles of white flowers, and an inflated calyx, with a beautiful network of veins. The young shoots are sometimes used like asparagus, and have a peculiar but agreeable flavor, somewhat resembling that of peas. They are best when most blanched. The cultivation of this plant was long ago strongly recommended, but it has not obtained a place among garden plants.—The **MOSS CAMPION** (*S. acaulis*) is a pretty little plant, with beautiful purple flowers growing in patches so as to form a kind of turf, one of the finest ornaments of the higher mountains of Scotland, and found also in Cumberland and Wales.—Many species, some of them British, are popularly called **CATCHFLY**, from their viscidty, as *S. Anglica*, a species found in sandy and gravelly fields in many parts of Britain.

SILENUS, son of Pan and Gæa (the earth), is generally represented as the chief of the Sileni or older Satyrs (q.v.), and the inseparable companion of Bacchus, with whom he took part in the contest against the Gigantes, slaying Enceladus. In most respects he seems to have resembled the other satyrs, and to have borne a strong likeness to sir J. Falstaff, being in addition noted for his wisdom and his power of prophecy. Silenus had a temple at Elis. See illus., **MYTHOLOGY**, vol. X.

SILE SIA, a province of the kingdom of Prussia, included in the limits of the German empire, lies s. of the provinces of Brandenburg and Posen, and is bounded on the e. by the Polish provinces of Russia and Austria, and on the s. and w. by the Austrian provinces of Silesia and Bohemia, and the kingdom of Saxony. It is divided into three governments: *Liegnitz*, in the w.; *Breslau*, in the e.; and *Oppeln*, in the s.; and these, again, are subdivided into circles. Area, 15,563 English sq. m.; population, 1895, 4,415,309, of whom 1,974,629 were Lutherans, 2,384,754 Catholics, and 47,593 Jews. The majority of the inhabitants speak the German language, but Polish is spoken by about 1,000,000, and there are a number of Slavic dialects. This province, the largest in size and second in population of the Prussian provinces, is crossed from n.e. to s.w. by a broad strip of mountainous country, which widens out at each extremity; and along the whole eastern boundary, and in the s. are ranges of low hills; in the n.w. and center the surface is flat and heathy, or sandy, with numerous stagnant pools. Silesia is almost wholly included in the basin of the Oder (navigable as far s. as Ratibor), which flows through it from s.e. to n.w., and receives from each side numerous tributaries; but a small portion in the extreme s. is drained into the Vistula, which here takes its rise. The soil is altogether fertile and well cultivated, more so, however, in Lower than in Upper Silesia; and cereals of all kinds, oil-plants, beet, hops, occasionally vines, and, above all, flax and hemp, are the crops of the province; but of late years the cultivation of tobacco and of plants yielding dye-stuffs has been receiving increased attention. Cattle and sheep, the latter excellent in quality, and partly of pure or mixed merino blood, are reared in the highlands. The mines of Silesia are of great importance; iron, copper, and lead are the chief products; coal is found in abundance. The manufacture of lace is carried on in the mountainous districts, chiefly around Schweidnitz; and the production of other fabrics, as linen, cotton, and woolen goods, paper, iron, leather, glass, clocks, railway carriages, and earthenware, is vigorously carried on throughout the province. There are also breweries, distilleries, liqueur factories, and mills. The Oder and the great central railway from Berlin and Posen to Vienna afford ample facilities for commerce. There are a university at Breslau, 37 gymnasias in the principal towns, two military schools, and a great number of professional and industrial schools.

Silesia was inhabited at the beginning of the Christian era by the Quadi and Lygii, who, like the other German tribes, advancing westward in the 6th c., were succeeded by Slavic tribes. It formed part of the Slavic kingdom of Moravia, was next joined to Bohemia, and in the beginning of the 10th c. to Poland. In 1163 it was separated from the kingdom of Poland, but was ruled by dukes who were of the royal line of Piast; these dukes, to repopulate the country, which had been devastated by the numerous civil wars, encouraged the settlement of German colonies, especially in lower Silesia. The practice of division and subdivision of territory prevailed so extensively in Silesia that

at one time it had no less than 17 independent dukes, and to save itself from reincorporation with Poland, it acknowledged the sovereignty of the kings of Bohemia, with which, and with Germany, from the time of the emperor Karl IV., it was indissolubly connected. In 1537 the duke of Liegnitz, one of the numerous Silesian princes, entered into an agreement of mutual succession (*erbbeerbrüderung*) with the elector of Brandenburg, on the extinction of either reigning line; and the other ducal lines becoming gradually extinct their possessions fell to Liegnitz or to Bohemia, or lapsed to the emperor. In 1675, when the last ducal family, that of Liegnitz, failed, its territories of Liegnitz, Brieg, and Wohlau would have fallen to Prussia; but the emperor of Germany refused to recognize the validity of the agreement of 1537, and took possession of the Liegnitz dominions, as a lapsed fief of Bohemia. The remainder of Silesia was thus incorporated into the Austrian empire. In 1740, Frederick II. of Prussia, taking advantage of the helpless condition of Maria Theresa of Austria, laid claim, on the strength of the agreement of 1537, to certain portions of Silesia; and without declaring war, marched into and took possession of the province, maintaining his hold despite the utmost efforts of Austria in 1740-42, and 1744-45, called the *first* and *second* Silesian wars. After the *third* Silesian war, better known as the seven years' war (q.v.), it was finally ceded (1763) to Prussia.

SILESIA, AUSTRIAN, a duchy and crown-land of the Austrian empire, bounded on the n.e. by Prussia, and on the s.w. by Moravia. Area, 1987 sq. m.; pop. '90, 605,649. The population is about equally divided between the Germans and the Slavs. It is mountainous in the w., where the Spiegltitzer, Schneeberge, a summit of the Sudetic chain, rises to the height of 4870 feet. The climate, though rough, is healthy, and the soil produces good crops of rye, oats, barley, flax, etc. Within the crown-land rise the Oder and Vistula. Cattle-breeding and bee-keeping are important branches of industry. Iron, lead, and coal mining are profitably pursued. The manufactures are principally spirits, copper and iron wares, chemicals, sugar, liqueurs, glass, marble articles, paper, etc., and linen and cotton fabrics.

SILEX (Lat. flint), a generic name given by some mineralogists to all those minerals of which silica is the principal ingredient. See QUARTZ.

SILHOUETTE, the name given to a profile or shadow-outline of the human figure, filled in of a dark color, the shadows and extreme depths being sometimes indicated by the heightening effect of gum or some other shining material. This species of design was known among the ancients, and was by them carried to a high degree of perfection, as the monochromes on Etruscan vases amply testify; but the name silhouette is quite modern, dating from about the middle of last century. It was taken from Étienne de Silhouette, the French minister of finance in 1759, who, to replenish the treasury, exhausted by the costly wars with Britain and Prussia, and by excessive prodigalities, inaugurated numerous reforms, and the strictest economy of expenditure. His extreme parsimony in all finance matters made him a choice subject for caricature; so that any mode or fashion that was plain and cheap—"surtouts" without plaits, trousers without pockets—was styled *à la silhouette*; and profiles made by tracing the shadow projected by the light of a candle on a sheet of white paper being then much in vogue, have continued to bear the name. Although without merit as a work of art, the silhouette presents a clear and well-marked profile, and such instruments as the pantagraph (q.v.), etc., used to be frequently employed to obtain profiles of a reduced size direct from the human features. Profiles cut out of black paper with scissors also receive the name of silhouettes.

SILICA. See SILICON.

SILICON, or SIL'CIUM (sym. Si, eq. 14—in new system, 28—spec. grav. 2.49), is one of the non-metallic elements (see CHEMISTRY). It may be obtained in three different forms, viz., the *amorphous*, the *graphitoid*, and the *crystalline*. It is the amorphous silicon which is obtained by the processes in common use, the second and third being obtained from this first modification.

Amorphous silicon presents the appearance of a dull brown powder, which adheres to the finger, is insoluble in water and in nitric and sulphuric acids, but readily soluble in hydrofluoric acid, and in a hot solution of potash. It is a non-conductor of electricity, and when heated in air or oxygen its external surface burns brilliantly, and is converted into silica, which fuses from the extreme heat, and forms a coating over the unburned silicon. *Graphitoid* silicon is obtained by exposing the amorphous variety to an intense heat in a closed platinum crucible. This form of silicon will not take fire when heated in oxygen gas, and resists the solvent action of pure hydrofluoric acid, although it rapidly dissolves in a mixture of nitric and hydrofluoric acids; moreover, as another point of difference, it is a conductor of electricity. For the description of *crystallized* silicon, we may refer to a treatise by Deville (in the *Ann. de Chimie*, 3d ser. vol. 49, p. 65), who obtained it in regular double six-sided pyramids of a dark steel-gray color.

Silicon, in a state of combination with oxygen, is the most abundant solid constituent of our globe; and, in less proportion, is an equally necessary ingredient of the vegetable kingdom, while in the animal kingdom it occurs in mere traces, except in a

few special cases. It is never found in nature except in combination with oxygen; but by a somewhat difficult process—which we need not here describe—it may be separated as a dark brown powder. It was first isolated by Berzelius in 1823. For our knowledge of the other modifications we are indebted to Wöhler and Deville.

Silicon forms only one oxide, *silica*, SiO_2 ; and the hydrate corresponding to it is $\text{Si}(\text{OH})_4$, or H_4SiO_4 , sometimes called *ortho silicic acid*. Another hydrate, called *meta silicic acid*, H_2SiO_3 , is said to exist. These hydrates are very loose compounds, and quickly separate into silica and water; in that respect they resemble sulphurous acid, H_2SO_3 , and carbonic acid, H_2CO_3 .

Silicon dioxide, also called *silicic acid*, or *silica*, SiO_2 , exists both in the crystalline and in the amorphous form. The best examples of the crystalline form are rock-crystal, quartz, chalcedony, flint, sandstone, and quartzose sand. Silica in this form has a specific gravity of about 2.6, and is only attacked with difficulty by potash or hydrofluoric acid. The amorphous form exists naturally in opal, and is obtained artificially as gelatinous silica, etc.; it differs from the former in its specific gravity, being about 2.3, and in its being rapidly dissolved by potash and by hydrofluoric acid. Pure silica (as it occurs in rock-crystal, for example) is perfectly transparent and colorless, and is sufficiently hard to scratch glass. The heat of the oxyhydrogen blowpipe is required for its fusion, when it melts into a transparent glass, capable of being drawn out into elastic threads. Perfectly pure silica in its amorphous form may be obtained by various chemical processes. If a solution of silicate of potash or soda be treated with hydrochloric acid, the silicic acid separates as a hydrate, and on evaporating this to dryness, and treating it with boiling water, silicic acid remains as an amorphous powder, which, after being washed, dried, and exposed to a red heat, may be regarded as chemically pure. The hydrated silicic acid mentioned in the above experiment is soluble in water and (more freely) in acids and alkalies. The solubility of hydrated silicic acid in water accounts for the presence of silicic acid in mineral springs, and in the Geysers of Iceland, as well as for its gradual separation from these waters in the form of petrifications. That silica or silicic acid is a true acid (although a feeble one) is obvious from its uniting with bases, especially those which are capable of undergoing fusion, and forming true salts, known as silicates. These silicates occur abundantly in nature; all the forms of clay, feldspar, mica, hornblende, augite, serpentine, etc., being compounds of this description. Silicic acid combines with bases in various proportions. The following table, borrowed from Miller's *Elements of Chemistry*, vol. ii., shows the combinations which are of the most usual occurrence:

	Examples.	Formulae.
$2\text{MO}, 3\text{SiO}_2$, or Sesquisilicates.	{ Silicate of lime.....	$2\text{CaO}, 3\text{SiO}_2$.
	{ Meerschaum (hydrated silicate of magnesia).....	$2\text{MgO}, 3\text{SiO}_2 + 2\text{H}_2\text{O}$.
	{ Wollastonite (silicate of lime).....	CaO, SiO_2 .
MO, SiO_2 , Neutral silicates.	{ Diopase (hydrated silicate of copper).....	$\text{CuO}, \text{SiO}_2 + \text{H}_2\text{O}$.
	{ Olivine.....	$2(\text{Mg}, \text{Fe})\text{O}, \text{SiO}_2$.
$2\text{MO}, \text{SiO}_2$, Dibasic silicates.	{ Iron forge cinder.....	$2\text{FeO}, \text{SiO}_2$.
$\text{MO}, 2\text{SiO}_2$, Bisilicates.	The composition of many of the ordinary varieties of glass may be approximately represented by mixtures of different silicates which have this formula.	

In the above formulæ MO stands for 1 equivalent of any metallic protoxide, such as lime, magnesia, or protoxide of iron.

The following are the general characters of the silicates: Most of them are fusible, the basic silicates fusing more readily than those which are either neutral or contain an excess of acid. Excepting the silicates of the alkalies, no silicates are soluble in water. The anhydrous, neutral, and acid silicates of the earths resist the action of all acids except the hydrofluoric.

In conclusion we may remark that silica derives its name from *silex*, flint, of which it is the essential constituent, and that it is largely employed in the manufacture of glass, china, and porcelain. For these purposes it is obtained in a finely comminuted state by heating flints or portions of colorless quartz to redness, and plunging them in cold water. The silica splits up into a friable mass, which may be easily ground to a fine powder. The use of silica in giving firmness and rigidity to various parts of the animal organs is exemplified in its free occurrence in the quill-part of the feather of birds, in the shields of certain infusoria, and in the spicula occurring in sponges; while its similar use in the vegetable kingdom is seen in its more or less abundant presence in the stalks of the grasses, more particularly in the cereals and in the bamboo (where it is especially deposited about the joints, and is known as *tabasheer*), in the equisetæ, etc.

Silicon may be made to combine with several other elements besides oxygen, but, with the exception of silicofluoric acid, these compounds are of no practical value. Thus silicon and hydrogen form a hydride of silicon, a colorless and spontaneously inflammable gas. Nitride of silicon is a bluish fibrous body, while sulphide of silicon is a white earthy powder. Silicon unites with chlorine, bromine, and probably iodine and fluorine, in two proportions corresponding to its oxygen compounds. Fluoride of silicon SiF_4 , is a colorless pungent gas, liquefiable under strong pressure, and solidifying at -220°F . (-140°C .), inflammable, and a non-supporter of combustion. It is obtained by heating sand or powdered glass with fluor spar and oil of vitriol, and when a stream of this gas is transmitted through water a reaction takes place; four molecules of water and

three molecules of the fluoride of silicon yielding silicofluoric acid, H_2SiF_6 , which remains in solution, and gelatinous silica, SiO_2 , which is deposited. A saturated solution of this acid forms a very sour fuming liquid, which does not directly attack glass, but if allowed to evaporate on it, causes erosion from the fluoride of silicon becoming evaporized, and free hydrofluoric acid being left. A dilute solution is frequently employed in the laboratory as a precipitant of potash, which it throws down in a transparent gelatinous form. With salts of baryta it gives a white crystalline precipitate. It combines with bases to form salts, none of which are of any special importance.

SILIQUE, *Siliqua*, in botany, the fruit of the *cruciferae*, a capsule opening by two valves, which, when ripe, separate from the base upward, leaving a central frame (*replum*), to which the seeds remain attached, and which is regarded as formed by parietal placentas, the valves giving way close to the suture. The seeds are either in one row or two. A **SILICULE** (*silicula*) is merely a silique of a different form, the true silique being long and narrow, the silicule broad and short, although Linnaeus made this difference the foundation of the orders (*siliquosa* and *siliculosa*) of his class *tetradynamia*, a distinction not now equally attended to in the subdivision of the natural order *crucifere*.

SILISTRIA, a t. of the new principality of Bulgaria, is situated on the right bank of the Danube, which is here nearly one-fourth of a mile wide, and is studded with numerous islands. The houses are mean, and built generally of wood, though sometimes of stone, and also of mud; the streets, like those of most Moslem cities, are crooked, narrow, dirty, and ill-paved; and the manufactures are insignificant, though there is a considerable trade in wood, wheat, and cattle. Pop. '93, 11,710. The Dobrudscha, ceded by Turkey to Rumania in 1878, is bounded by a line running from a point just e. of Silistria to Mangalia on the coast. The importance of Silistria lay formerly in its value as a military outpost of Turkey. Its walls were constructed of solid masonry, but consisted merely of a fortified *enceinte* (q.v.) surrounded by a ditch, the great strength of the fortress depending upon the support given to it by detached works. Silistria is a town of great antiquity, and was a fortress under the Byzantines. Here, in 971, the Byzantine emperor, John Zimisce, routed the Russians under Sviatoslav. It has been repeatedly assaulted and taken by the Russians. In 1849 Silistria was made a stronghold of the first class, and was rendered almost impregnable by the addition (1853) of 12 detached forts on the s. and east. On the outbreak of the Crimean war the Russians laid siege to it, with an army of from 60,000 to 80,000 men, but were compelled to retreat after 39 days. The congress of Berlin in 1878, when erecting Bulgaria into a principality, decreed that the fortifications of Silistria, like those of the other Bulgarian cities, should be dismantled.

SILK AND SILK-WORM. The name *silk* is derived by the not unusual substitution of *l* for *r*, from Lat. *sericum* (Gr. *serikon*), so called as coming from the country of the Seres or Chinese. The **SILK-WORM** is the caterpillar of the **SILK-WORM MOTH**, of which there are numerous species belonging to the genus *bombyx* and other genera of the family *bombycidae*, lepidopterous insects of the section popularly known by the name moth (q.v.). The *bombycidae* have a very short and rudimentary proboscis, living for a very short time in their perfect state, and taking little or no food; the body is thick and hairy the wings are large and broad, either extended horizontally when at rest, or inclined like the sides of a roof; the antennae are pectinated. The caterpillars feed on the leaves and other tender parts of trees or other plants; the chrysalids are inclosed in a cocoon of silk, which gives to some of the species a great economical importance. The most important is the **COMMON SILK-WORM** (*bombyx mori*), a native of the northern provinces of China. The perfect insect is about an inch in length, the female rather larger than the male; the wings meeting like the sides of a roof; the color whitish, with a broad pale brown bar across the upper wings. The females generally die very soon after they have laid their eggs, and the males do not survive much longer. The eggs are numerous, about the size of a pin's head, not attached together, but fastened to the surface on which they are laid by a gummy substance, which, when dry, becomes silky. They are laid in the end of summer, and are hatched in the beginning of next summer. The caterpillar is at first very small, not more than a quarter of an inch in length, but rapidly increases in size, till, when full grown, it is nearly 3 in. long. It is of a yellowish gray color. The head is large. On the upper part of the last joint of the body is a horn-like process. The skin is changed four or five times during the growth of the caterpillar. Before each change of skin, it becomes lethargic, and ceases to eat, whereas at other times it is very voracious. When the skin is ready to be cast off, it bursts at the forepart, and the caterpillar then, by continually writhing its body, without moving from the spot, thrusts it backward; but silk-worms frequently die during the change of skin. A very rapid increase of size takes place while the new skin is still soft. The natural food of the silk-worm is the leaves of the white mulberry, but it will also feed on the leaves of some other plants, as the black mulberry and the lettuce. When so fed, however, it produces silk of inferior quality. The silk-producing organs are two large glands (*sericteria*) containing a viscid substance, which extend along a great part of the body, and terminate in two *spinnerets* in the mouth. These glands become very large when the change to the chrysalis or pupa state is about to take place. When about to spin its cocoon, the silk-worm ceases to eat, and first produces the loose rough fiber which forms

the outer part of the cocoon, and then the more closely disposed and valuable flier of its interior. In this process, the position of the hinder part of the body is little changed, but the head is moved from one point to another; and the cocoon when finished is much shorter than the body, which, however, being bent, is completely inclosed in it. The cocoon is about the size of a pigeon's egg. Each fiber of silk, when examined by a microscope, is seen to be double, being equally derived from the two silk-producing organs of the caterpillar. A single fiber often exceeds 1100 ft. in length. The time of the silk-worm's life in the caterpillar state is generally about eight weeks. About five days are occupied in the spinning of the cocoon; after which about two or three weeks elapse before the cocoon bursts and the perfect insect comes forth. The natural bursting of the cocoon is, however, injurious to the silk, and the silk-worm rearer prevents it by throwing all the cocoons into boiling water, except those which he intends to keep in order to the maintenance and increase of his stock. These he selects with care, so that he may have about an equal number of male and female insects, the females being known, even in the chrysalis state, by their larger size. The cocoons intended for the production of moths are placed on a cloth in a somewhat darkened room, of which the temperature is near, but does not exceed, 72° Fahr.; and the moths, when produced, show no inclination to fly away, but remain on the cloth, lay their eggs, and die there. It is an interesting peculiarity of this valuable species of moth, that neither in the caterpillar nor in the winged state does it show that restless disposition which belongs to many others, the caterpillars remaining contentedly in the trays or boxes in which they are placed, feeding on the leaves with which they are there supplied, and at last only seeking a proper place to assume the chrysalis form on small bundles of twigs which are placed for that purpose above the trays; the perfect moths, in like manner, abiding almost in one spot, and scarcely caring to use their wings. Owing to this peculiarity it is capable of being reared and managed in a way which would otherwise be impossible. See *illus.*, BUTTERFLIES, ETC., vol. III.; figs. 58-61; FOWL, ETC., vol. VI., figs. 33, 34.

The silk-worm is liable to various diseases, particularly to a fungus known as *silk-worm-rot* or *muscardine* (q.v.).

Of the other species of silk-worm, many are rapidly increasing in commercial importance. The following is an enumeration of the chief silk-producing insects; those in italics are not as yet employed in manufactures:

Bombyx mori.—The common silk-worm, native of India, and reared in other parts of the world.

B. crasi.—Crosses have been obtained between this and *B. mori*, yielding excellent silk, at Mussooree.

B. textor.—Native of Mussooree.

B. sinensis.—China.

B. huttoni.—Silk collected in Mussooree.

B. Horsfieldi.—Native of Java.

Attacus atlas.—Native of India, and said to yield some of the "Tusseh silk."

A. Guerini.—Native of Bengal.

A. ricini.—Native of Assam.

A. cynthia.—The "Eria," or "Arrindy" silk-worm, native of India, now extensively raised in Hong-kong, Nepal, Mussooree, Java, and to some extent in southern Europe. It feeds on the leaves of the *ailanthus* (q.v.) tree.

Antheræa Mezankooria.—The *Mezankooria* silk-moth.

A. Paphia.—The true tusseh or tussur moth, native of Darjeeling, and other parts of upper India. It is produced very extensively, and is chiefly collected in the jungle districts by the Sahars and other half-wild castes who live in the jungles. The cocoons are so carefully concealed in the leaves that much care is required to discover them, the only indication being the dung of the caterpillar under the trees. The tusseh silk is easily wound off from the cocoons in the same way as that of the common silk-worm.

A. Assama.—The Moonga, or Moogha, native of Assam.

A. Pernyi.—North China.

A. Perrottetti.—North China.

A. Roylei.—Mussooree.

A. Helferi.—Darjeeling.

A. Jana.—Java.

A. Frithii.—Darjeeling.

A. Larissa.—Java.

The preceding seven are all called tusseh moths.

Actias Selene.—Darjeeling.

Saturnia pyretorum.—China.

S. Grotei.—Darjeeling.

Lepa Katinka.—Java.

Neoris Huttoni.—Mussooree.

Caligula Tibeta.—Mussooree.

C. Simla.

Salassa Lola.—South-east Himalaya.

Cricula triferrestrata.—Java.

It will be seen by the above list that hitherto very few of the silk-moths have been turned to man's profit. The first in importance after the common silk-worm is the true *tussek*, next the *moonga*, the silk from both of which can be wound off the cocoon; and then the *eria*, which cannot be wound easily, and is therefore generally carded.

Silk appears not to have been well known to the ancients; although several times mentioned in the translations of the Bible, the best authorities deny that it is in the original, or that it was known to the Hebrews. Among the Greeks, Aristotle is the first who mentions it, and he only says that "Pamphile, daughter of Plates, is reported to have first woven it in Cos;" and from all the evidence which has been collected, it would appear that the natives of Cos received it indirectly (through the Phenicians and Persians) from China. The silken webs of Cos found their way to Rome, but it was very long before they were obtainable except by the most wealthy. The cultivation in Europe of the worm itself did not take place until 530 A.D., when, according to an account given by Procopius, the eggs were brought from India (China) to the emperor Justinian by some monks.

In China the cultivation of silk is of the highest antiquity, and according to the greatest Chinese authorities, it was first begun by Si-ling, the wife of the emperor Hoang-ti, 2,600 years B.C., and the mulberry was cultivated for the purpose of feeding them only 40 years later.

Since its introduction into Europe it has always formed a great branch of industry in Italy, Turkey, and Greece, and it has been cultivated to some extent in France, Spain, and Portugal. In England, too, from time to time, laudable efforts have been made to cultivate it, especially by Mrs. Whitby of Newlands, Mr. Mason of Yately in Hampshire, and lady Dorothy Neville of Dangstein in Hampshire; but their partial success has not encouraged others to pursue this branch of industry, which requires a warmer and less variable climate and cheaper labor than we can command.

The quantity of silk raised in the world is enormous. Great Britain imports annually in the unmanufactured state: "Raw" silk, about 6,500,000 lbs.; "waste," or knubs and husks, about 3,500,000 lbs.; besides undyed "singles," about 5,700 lbs.; tram, about 7,000 lbs.; organzine, about 39,000 lbs.; and dyed-singles and tram, about 3,000 lbs. organzine, about 10,000 lbs. Singles, tram, and organzine are terms applied to the thread after it has undergone certain operations (to be afterward described). The total quantity is thus about 10,000,000 lbs., of the value of £5,000,000; and in addition to this we import manufactured silk goods to the value of about £12,500,000; so that the importance of this little insect to Great Britain alone is represented annually by about £17,500,000. It requires 1600 worms to raise a pound of silk.

Rearing of Silk-worms.—It is of the first consequence in the production of silk that one of the species of mulberry should be cultivated, and that it should be so favorably situated as to climate that its foliage is in readiness for feeding the young worms when they are first hatched from the eggs. The species best adapted is the white mulberry, *morus alba*. The extreme lateness of season at which the black mulberry produces its leaves prevents its employment generally, besides which it will not bear the loss of its leaves so well. It is said that in some parts of China the silk-worm is easily reared upon the trees in the open air. So little has it a tendency to wander far from the place of its birth, if food be at hand, that it only requires a warm, dry atmosphere to bring it to perfection; but usually, even in China, and in all other countries, it is thought desirable to raise the silk-worm in properly arranged buildings, and to supply it with mulberry leaves gathered from day to day. In India, China, and other tropical countries, the eggs hatch readily at the proper time by the natural heat; but in southern Europe artificial heat is almost always required; formerly the heat of fermenting dung was found serviceable, and the warmth of the human body was also used, the eggs being carried in little bags in the bosom of the cultivators; but now they are regularly hatched by stove-heat, beginning with a temperature of 64° Fahr., which is gradually increased through ten days to 82°, at which it is maintained until the eggs are hatched. Experience has shown that the operation is facilitated by washing the eggs in the first place with clean water; and some cultivators also wash them in wine, the value of which is very questionable. Washing is found to remove a certain gumminess and other impurities from the eggs, which would otherwise impede the hatching. When the silk-worms have been regularly developed as above described, it is usual to place above the trays various little contrivances for the caterpillar to spin within; many of the Italian growers employ an ingeniously simple arrangement, which lasts many seasons, and when not in use occupies very small space. It consists of a number of thin slips of wood, about an inch and a half broad, and all cut sufficiently long to reach across the trays. They are each cut at intervals of an inch half through, so that one will fit into another, and when complete they all form a series of cells, which, set in a tray, form the very best receptacles for the silk-worm to spin in. When not in use, the whole arrangement can be compressed into very small compass for convenience of storage. Others use little cones of paper, or small twigs, among which the cocoons are spun.

In feeding the worms, care is taken so to distribute the food on the shelves or in the trays that the insects shall not crowd together; and for this reason the most careful cultivators chop the leaves small, and strew them very evenly about. Great care is taken not to let the worms of one hatch mix with those of another, unless of exactly the

same age, otherwise the stronger insects would deprive the younger of their food. Many other niceties of attention are required, which altogether render the successful rearing of silk-worms a matter of much anxiety and labor.

Preparation of Silk.—When the cocoons are completed, which is known by the absence of any sound within, they are carefully sorted, and a certain number are kept for laying. The sexes are readily known by the difference of shape as well as of size, the female being plumper, and the male, besides being much smaller, having a central depression and sharper extremities. The French growers sort them into nine varieties, those which are less compact, or in which the worm has died—a fact known by external indications—being separated from the good ones. When the sorting is finished, the cocoons are placed in an oven with a gentle heat, which kills the inclosed chrysalis, otherwise they would all become *perforated* by the insect eating through; they are then prepared for winding by first removing the flossy covering, which is often somewhat hard and compact. The cocoons are placed in basins of water, kept warm by charcoal fires, or, in the larger establishments, by steam. This softens and dissolves the natural gum which coats the silk, and makes the various coils of silk adhere together in the cocoon. The operator then takes a small branchy twig, and stirs them about in the water. This is sure to catch hold of any liberated ends which may be floating in the water. From three to five of these ends are taken and twisted together with the fingers, so as to unite them into one thread, which is passed through a polished metal or glass eye in the reeling-machine, which is so far from the hot-water basin as to give the softened gum on the silk time to dry in its passage from the basin to the reel. In large *filatures* or silk establishments, complex machinery is used for winding; but reeling apparatus of the greatest simplicity is used by the Chinese, East Indians, and others with almost equal effect, when carefully done, except in the amount of work accomplished. In all cases, however, the principle is the same, and is very simple. Great care and skill are required in reeling silk from the cocoons, because, although the reeler starts with four or five cocoons, not only are their individual threads apt to break, but they are not all of the same length, so that one will run out before the others. These matters are carefully watched; and as often as a thread breaks, or a cocoon runs out, another thread is joined on, and is made to adhere to the compound thread on the reel by its natural gumminess. Each cocoon generally yields 300 yards of thread, so that it takes 1200 or 1500 yards to make 300 yards of the filament of raw silk, by which name the reeled silk is always known. The raw silk is made up into hanks of various sizes. That from China and Japan is tied in packages of six hanks each, technically called *books*, and sometimes the ends of these books are covered with silken caps very curiously formed out of a single cocoon, so managed as to form a filmy cap sufficiently large to cover a man's head. The method used by the Chinese to accomplish this is quite unknown in Europe. These caps or bags, when closed, are sometimes nearly a foot square, and much of the wadding used by the Chinese dressmakers for padding is made by placing these bags upon each other to the required thickness.

Notwithstanding the care taken in reeling the silk from the cocoons, and forming several threads into one, it is not ready for the weaver, but has to undergo the processes called collectively *throwing*. In this country, this is a special trade, the *silk throwster* usually conducting it in large mills with extensive machinery, where the above processes are all carried on, generally by steam-power. The silk reaches the throwster in hanks as imported. These are put into clean soap and water, and carefully washed, ties having been placed at intervals, to prevent the silk entangling. After being dried by hanging in the drying-room, they are placed on large skeleton reels called *swifts*, so adjusted that they will hold the hanks tightly. In a *swift*, the spokes are in pairs. They are made of thin pieces of lancewood, and each pair are rather nearer together at the axle than at the circumference, where they are connected together by a small band of cord. These bands are so tied that they will slip down easily to admit of the hanks being placed; then, by pushing the cords upward, the hank can be stretched to its fullest extent. This is necessary to compensate for the varying lengths of the hanks received from different countries.

When the *swifts* are set in motion, the silk is carried from the hanks to bobbins, upon which it is wound for the convenience of further operations. The bobbins are then taken from the *winding* to the *cleaning* machine, when they are placed on fixed spindles, so that they will turn with the slightest pull; and the thread is passed through a small apparatus attached to the machine, which is specially called the *cleaner*, and consists essentially of two polished smooth-edged blades of metal, attached to a part of the frame of the machine. They are held together by a screw, and are slightly opened or closed by another screw, so that the thread can be put between them down to a small orifice, and then, by tightening the screw, preventing its return, after passing through this small hole, which is the gauge of the thread, and which removes any irregularities or adherent dirt. The silk next passes over a glass or metal rod, and then through another small hole, much larger than that of the *cleaner*, and usually made of glass, on to the bobbin, upon which it is wound by the action of the machine. The next process is *twisting* the cleaned thread, by which it becomes better adapted for being combined with other threads. *Doubling* is the next process, and this consists in running off a number of bobbins of *twisted* silk on to one bobbin of a larger size, which is put into the *throwing*-machine, when the ends of the *doubled* silk are passed through a smooth hole on to a

large reel, which rewinds it into hanks, but twisting the threads into a fine cord as it goes from the bobbins to the reel. This operation of *throwing* derives its name from the Saxon *throwan*, to whirl or twist. After this the hanks have to be again wound on reels and bobbins for the weaver, the former for the warp, and the latter for the weft. For many purposes, only some of these operations are required. Thus for common and light fabrics, such as *Persian gauze*, etc., only the two first are needed—viz., the *winding* and *cleaning*, and the material is called *dumb-singles*. If it has been *wound*, *cleaned*, and *thrown*, it is called *thrown-singles*, and is used for weaving common broad stuffs, or plain silks and ribbons. If *wound*, *cleaned*, *doubled*, and *thrown*, it is called *tram*, and is used for the richest silks and velvets, but only for the weft or shoot; and if *wound*, *cleaned*, *spun*, *doubled*, and *thrown*, it is called *organzine*, and is used for the warps of fine fabrics.

Before winding the cocoons, a flossy portion has to be removed; and after all has been wound off, another portion remains, like a compact bag; these are collected and sold under the name of *waste-silk*, and to these are added the fragments of broken threads, which accumulate in considerable quantities during the reeling and throwing operations. Formerly, very little use was made of waste-silk; not a little of it was employed by engineers and others for mere cleaning purposes; although as early as 1671, a proposition was made by a manufacturer named Edmond Blood to make it available by carding it with teasels or rowing-cards. He took out a patent for this invention, but apparently did not bring it into use. Another patent was taken out by Mr. Lister of Bradford, which has done wonders; now the waste is all spun into yarn, thereby greatly economizing the use of silk, as the quantity of silk-waste always greatly exceeds the amount of good silk reeled off. The processes employed in the production of silk-yarn from the waste differ little from those for spinning other materials. See SPINNING.

The silk manufactures of Britain are chiefly located in Spitalfields, London, at Macclesfield and Congleton in Cheshire, at Derby, and in Glasgow. The dyeing of silk is done chiefly in the neighborhood of London, at Nottingham, and at Manchester; and considerable quantities of silk goods are sent from India to be printed with patterns in London and other parts of England. There would certainly appear to have been no lack of encouragement of the silk industry in the early days of American colonial history. James I. was enthusiastic on this subject (see MANUFACTURES), and the colonists themselves devoted much time and labor to the growth of the mulberry tree, and the culture of silk-worms. In 1732 the colonial government of Georgia, allotted a piece of ground for use as a nursery plantation for white mulberry trees. Lands were granted to settlers on condition that they planted 100 of these trees on every 10 acres when cleared, 10 years being allowed for their cultivation. In 1749 the British parliament passed an act exempting from duty all raw silk which was certified to be the production of Georgia or Carolina. In the same year an Italian expert was sent to Georgia to conduct a filature—for reeling, doubling, cleaning, and twisting, or throwing, silk—and in 1759 the receipts of cocoons at the filature exceeded 10,000 pounds, and the quality of the raw silk was so good that it sold in London as high as three shillings a pound more than that from any other part of the world. After 1759, however, the production of silk in Georgia fell off greatly, though a French settlement at New Bordeaux, on the Savannah river, manufactured considerable quantities of sewing-silk during the revolution. Mansfield, Conn., became, in the latter part of the 18th c. an important silk-raising section; and this continued to be a fixed industry in that locality, though but little was done in it elsewhere in New England. Pennsylvania engaged in the culture about 1767, and a filature was established in Philadelphia in 1769 or '70, and in 1771 2,300 pounds of cocoons were brought there to reel. This state maintained some prominence in the industry up to the time of the revolution, but it then died out and was not notably revived. From the period of the close of the revolution up to about 1825 the silk manufacture in the United States was purely domestic, families making small quantities—hardly ever reaching 100 pounds per annum in a single family. The importation of silk goods in the mean time had increased enormously, so that in 1821 it amounted to \$4,486,924. It was felt that this costly importation should be stayed, if possible, and several congressional committees investigated the subject, and voluminous reports were made upon it. This brought about the enthusiastic culture of the *morus multicaulis*, which grew into a mania (see MANUFACTURES), during whose existence hundreds of speculators and thousands of private buyers were ruined. The result of this speculative incident, the financial depression of 1837, and the fact that in 1844 a blight affected all the mulberry trees in the country—all these causes combined were disastrous to silk culture in the United States, and the effort to rear silk-worms ceased, not to be revived again, except in California; where 1860-75, the business was largely prosecuted, but ended disastrously. The first silk-mill on the western continent was set up at Mansfield, Conn., in 1810. The manufacture was introduced into Philadelphia about 1815; and as early as 1824 the Jacquard loom began to be used there. Power-looms were next introduced, and power-loom weaving was begun about 1838, simultaneously with its adoption in Switzerland. In 1829 there was a manufactory for silk ribbons from

American silks started in Baltimore, but it was short-lived. The business progressed at Mansfield, which soon became a silk-manufacturing center. From 1831 to '39, a large number of factories were started at Windsor Locks, Conn.; Poughkeepsie, N. Y.; in Philadelphia, and elsewhere, the most of which failed. Burlington, N. J., became an important silk-producing locality, beginning about 1838; and included the culture of the mulberry tree and growth of silk-worms, as well as the manufacture of silk. Hartford, So. Manchester, Conn., Holyoke and Northampton, Mass., and Haydenville, the scene of the Mill river disaster in 1874 (bursting of a reservoir containing 6,000,000 tons of water), are among the New England towns in which silk has been manufactured extensively. But the most important center of this industry in America is Paterson, N. J. (q. v.), where the water-power of the Passaic river, facilities for transportation, etc., seemed to offer the best possible conditions for its prosecution. The first silk-mill in Paterson was set up about 1838, in the fourth floor of Samuel Colt's pistol factory. This was followed by the establishment of other factories, until in the years immediately succeeding the conflict of 1861-1865, Paterson became—and has since remained—the chief seat of silk manufacture in the United States. The number of silk establishments reported in the state of New Jersey in the year 1890 was 132; average number of men and women employed therein, 17,917; of boys and girls, 863; wages paid, \$7,176,180; capital invested, \$16,809,927; value of product, \$30,760,371.

The quantities and values of raw silk imported to supply the needs of American manufactures, were as follows in the years * named:

1876.....	1,354,991 lbs.	\$5,424,408
1877.....	1,186,170 "	6,792,937
1878.....	1,182,750 "	5,103,084
1879.....	1,889,776 "	8,371,025
1880.....	2,562,236 "	12,024,699
1881.....	2,531,617 "	10,889,675
1882.....	2,877,776 "	12,885,149
1883.....	3,255,324 "	14,042,696
1890.....	5,943,360 "	24,331,867

* Year ended June 30.

A general view of the silk industry in the U. S. is shown from the following figures from the census of 1890:

STATE.	Establishments.	Average Number of Employees.	Wages Paid per Year.	Net Value of Products.
California.....	9	214	\$83,566	\$266,312
Connecticut.....	35	5,081	2,006,804	8,123,561
Illinois.....	10	805	295,636	785,845
Maryland.....	4	75	24,233	100,361
Massachusetts.....	20	3,216	1,296,399	4,611,959
New Jersey.....	132	17,917	7,176,180	25,405,982
New York.....	185	13,151	5,584,399	17,736,315
Ohio.....	3	40	13,685	33,927
Pennsylvania.....	66	9,522	2,981,334	11,404,223
Rhode Island.....	3	194	61,978	135,000
All other States.....	5	698	156,104	551,114
Totals.....	472	50,913	\$19,690,318	\$69,154,599

SILK-COTTON. Under this name, various silky fibers are from time to time brought from tropical countries to Europe; they are all of the same general character, and are produced by the trees composing the genus *bombax* and other genera recently separated from *bombax*, of the natural order *sterculiaceæ*, known as silk-cotton trees. These trees are natives of the tropical parts of Asia, Africa, and America. The fiber fills their large woody capsules, enveloping the seeds, and is produced in great abundance, but is too short, too smooth, and too elastic to be spun by the machinery used for cotton; although attempts have been successfully made on a small scale in India to spin and weave it; and that of *bombax villosum*, which is of a beautiful purple color, is woven into cloth and made into articles of dress in new Spain. Silk-cotton is much used for stuffing pillows, mattresses, and sofas. Sir James Emerson Tennent says it "makes the most luxurious stuffing" for them. It has the fault, however, of being easily broken and reduced to powder, but might probably be very useful in the manufacture of gun cotton and colloidion. The silk-cotton of the East Indies is imported into Britain under the name of *moc-main*.—*bombax ceiba*, the common silk-cotton tree of the West Indies and South America, attains a very great size, its trunk sometimes being so thick that it could not be encompassed by the outstretched arms of sixteen men, and canoes are hollowed out of it of an average burden of 25 tons. The wood is soft and spongy, but is used for many purposes, and when cut into planks, and saturated with lime-water, it bears exposure to the weather for many years.—*Bombax malabaricum*, or *salmalia malabarica*,

is the common silk-cotton tree of the East Indies. It is a tall tree, covered with formidable thorns. Although it is a tropical tree, its leaves fall annually; and just before the fresh leaves appear, it is covered with crimson tulip-like flowers, so abundant that, "when they fall, the ground for many rods on all sides is a carpet of scarlet."

The fiber of the capsules of *chorisia speciosa* and *C. Pecholiana*, trees nearly allied to the genus *bombax*, and natives of Brazil, is known as **VEGETABLE SILK**. It has a beautiful satiny luster, and is very light, but no mode of spinning and weaving it has yet been invented.

SILK SPIDER, *Nephila plumipes* (Koch), a species of spider discovered by Prof. Burt G Wilder on the sea islands of South Carolina in 1865. It produces two kinds of silk, yellow and white, having a continuous length of nearly two miles.

SILK-WEED, or **MILK-WEED**. See **ASCLEPIADACE**; **ASCLEPIAS**.

SILK-WORM GUT, a material used by anglers for dressing the hook-end of the fishing-line. It is prepared from the silk-worm at the period when it is just about to spin, and the sericteria or silk vessels are distended with the secretion. The worms are immersed for 12 or 14 hours in strong vinegar, and then taken separately, and pulled in two very gently. The skilled operator knows at sight if the soaking in vinegar has been sufficient, and if so, he lays hold of one end of the viscid secretion, which is seen in the silk glands, and attaches it to the edge of a board; the other end he stretches to the other edge of the board, and attaches it with a pin. When a number are drawn across the board, it is set in the sun for the threads to dry, when they are tied into bundles for use. They are chiefly produced in Italy and Spain.

SILL, EDWARD ROWLAND, poet and educator, born at Windsor, Conn., 1841; educated at Andover, Mass. and at Yale College, where he was class poet. After graduating in 1861 he resided in California till 1866; entered Harvard Divinity School, but soon abandoned theology; taught school in New York and did literary work; taught school in Ohio, three years; in 1871 became principal, Oakland, Cal., high school; prof. English language and literature in University of California, 1874-82; resumed literary work at Cuyahoga, O.; died at Cleveland in 1887; published *The Hermitage and other Poems* (1867); *The Venus of Milo and other Poems* (privately printed, 1883). A posthumous volume of verse appeared in 1888, and a new edition of his poems in 1889.

SILLIMAN, BENJAMIN, American physicist, was b. at North Stratford (now Trumbull), Conn., United States, Aug. 8, 1779. His father was a distinguished lawyer, and a brig. gen. in the war of independence. He was educated at Yale college, New Haven, in which he was appointed a tutor in 1799, and was admitted to the bar in 1802, but soon after received from the college the appointment of professor of chemistry; which he accepted only on condition of visiting some of the seats of learning in Europe, to observe the progress of the science. His tour in Europe, 1805-6, was one of the first of which an account was published in the United States. Uniting mineralogy and geology to chemistry, he made a geological survey of Connecticut, observed the fall of a meteorite; constructed, with the aid of Prof. Hare, a compound blow-pipe, and repeated the experiments of sir Humphry Davy. In 1822 he first established the fact of the transfer of particles of carbon from the positive to the negative electrode of the voltaic apparatus. In 1818 he founded the *American Journal of Sciences and Arts*, better known as *Silliman's Journal*, of which he was for 20 years the sole, and for 8 more the principal editor. Besides his labors as professor and editor, he began in America the since widely extended work of popular scientific education, by giving public lectures on his favorite sciences in all the chief cities. In 1830 he published a text-book on chemistry, and soon afterward edited an edition of *Bakewell's Geology*. An account of his last visit to Europe was published in 1851, and reached 6 editions. His last course of lectures was given in 1855, when his son, BENJAMIN SILLIMAN, Jr., who had been his associate, became his successor. He died in Nov., 1864.

SILLIMAN, BENJAMIN, JR., b. Conn., 1816; graduated at Yale college, 1837, where he was an instructor in chemistry, mineralogy, and geology, 1838-46; professor of applied chemistry, 1846; one of the beginners of the Yale scientific school, 1847; professor of medical chemistry and toxicology, university of Louisville, Ky., 1849-54; and of chemistry, as successor to his father, at Yale college from 1854 for abt. 30 years; state chemist of Connecticut, 1869; associate editor of *Silliman's Journal of Science*, 1838; and associate proprietor, 1846; a director of the departments of chemistry, mineralogy, and geology in the world's fair at New York, 1853; for many years secretary of the American association for the advancement of science. He published *First Principles of Chemistry*; *Principles of Physics*; many papers on scientific subjects; and was also a popular lecturer on science. He d. 1885.

SILLOTH, a t. and watering-place of England, of quite recent origin, in the county of Cumberland, at the terminus of a branch of the North British railway, 12 m. n.n.e. of Maryport, is picturesquely situated on the Solway. The port is of growing importance, and possesses a good stone dock, and there is a growing trade in coal and grain. Silloth is much resorted to for sea-bathing, the climate being mild and salubrious, and considered highly favorable for those affected with pulmonary complaints. Pop. about 2500.

SILLOWAY, THOMAS WILLIAM, b. Newburyport, Mass., 1828; ordained minister of the Universalist faith, 1862; became a designer of plans for public buildings in Boston.

1851. He has built and reconstructed several hundred churches and public buildings in different parts of the United States. He has edited books on architecture, ventilation, etc., and published *Text-Book of Modern Carpentry*.

SILLO. See ENSILAGE.

SILLOAM, or **SHILOAH**, is spoken of three times in Scripture: Isaiah says, "the waters of Shiloah that go softly;" Nehemiah calls it "the pool of Siloah;" and John, "the pool of Siloam." Josephus says it was at the mouth of the Tyropeon, where a fountain is still found. Jerome mentions its intermitting flow, which is still observed. The water descends from the fountain of the Virgin through a long subterranean passage into a basin under the cliff, and thence into a larger reservoir. That this passage connects the fountain and the pool, Dr. Robinson proved by crawling through it from one end to the other, a distance of 1750 feet. He witnessed also the intermitting flow in the fountain, as well as the pool.

SILPHIUM, a genus of plants belonging to the order *compositæ*. Generic characteristics: heads many-flowered, radiate; rays numerous, pistillate and fertile; ovaries in two or three rows; disk flowers apparently perfect, but with undivided style and sterile; scales of the broad and flattish involucre imbricated in several rows, broad, and with loose, leaf-like summits, except the innermost, which are small. They are tall, coarse, perennial herbs, having a copious resinous juice, and large corymbose-panicled yellow flowering heads. *Silphium luncinatum*, called rosin-weed and compass-plant, is rough and bristly, growing from 3 to 6 ft. high; leaves pinnately parted, with divisions lanceolate or linear, rarely entire: scales of the involucre ovate, tapering into long and spreading rigid points; achenia, or one-seeded capsule, broadly winged and deeply notched. It grows on the prairies of Michigan, Wisconsin, and southward and westward: blossoms in July. It is called compass-weed from its reputed property of growing so as to point its leaves to the cardinal points of the compass. Another species, *S. terebenthinaceum*, the prairie burdock, grows from 4 to 10 ft. high, with many small heads in a panicle at the top; leaves ovate-cordate, serrate toothed, thick, rough, more so beneath, and from 1 to 2 ft. long on slender leaf-stalks. A variety, *pinnatifidum*, has deeply cut, or pinnatifid leaves. It grows on prairies and oak openings, Ohio, Michigan, Wisconsin, and southward: blooms in July and September. Other species are *S. trifoliatum*, *S. asteriscus*, *S. integrifolium*, and *S. perfoliatum*, the cup-plant, which grows from 4 to 8 ft. high, having ovate leaves, coarsely toothed, the upper united by their bases, forming a cup-shaped disk; heads corymbose, and achenia winged and variously notched; grows on rich soils along streams in Michigan, Wisconsin, and southward. Also escaped from gardens eastward: blossoms in July.

SILURIAN ROCKS, a large division of the palæozoic rocks, between the old red sandstone and the Cambrian strata. They comprise the greater portion of the rocks called by Werner "transition," because, as he thought, in their structure they exhibited an intermediate character between Lehman's "primary" or metamorphic rocks, and the "secondary" or fossiliferous deposits. But the fossils peculiar to these beds having been found in rocks without the transition structure, the name has long ago fallen into disuse. The term "grauwacke" or "graywacke," a miners' term, was also introduced from the Germans, and for some time employed to designate these rocks, because of the abundance in them of a compact argillaceous sandstone; but this awkward name has also given place to Silurian, a term introduced by sir R. I. Murchison when he first established the system, and derived from the district where he investigated the strata, which was the region of the Silures, (apparently a non-Celtic, Euskarian tribe).

The Silurian system contains an enormous thickness of rocks, nearly 30,000 ft., according to some estimates, the absolute thickness being greatly increased by immense beds of interstratified igneous rocks. The upper limit, underlying the old red sandstone, is universally accepted, but there has been considerable diversity of opinion in regard to the inferior boundary. Prof. Sedgwick, having described the rocks of n. Wales, which at first were considered to be older than the series which Murchison had illustrated, designated them Cambrian. This name has been retained for the immense mass of indurated shales and sandstones of a thickness nearly equal to that of the Silurians, which contain only faint traces of organic life, and underlie the Llandeilo formation. But Sedgwick claims also the lower Silurian rocks as a portion of his system; the priority of name, and the uniform facies of the organic remains of the whole of the Silurian rocks, have, however, induced geologists to consider the limits as originally given by Murchison as those of the system.

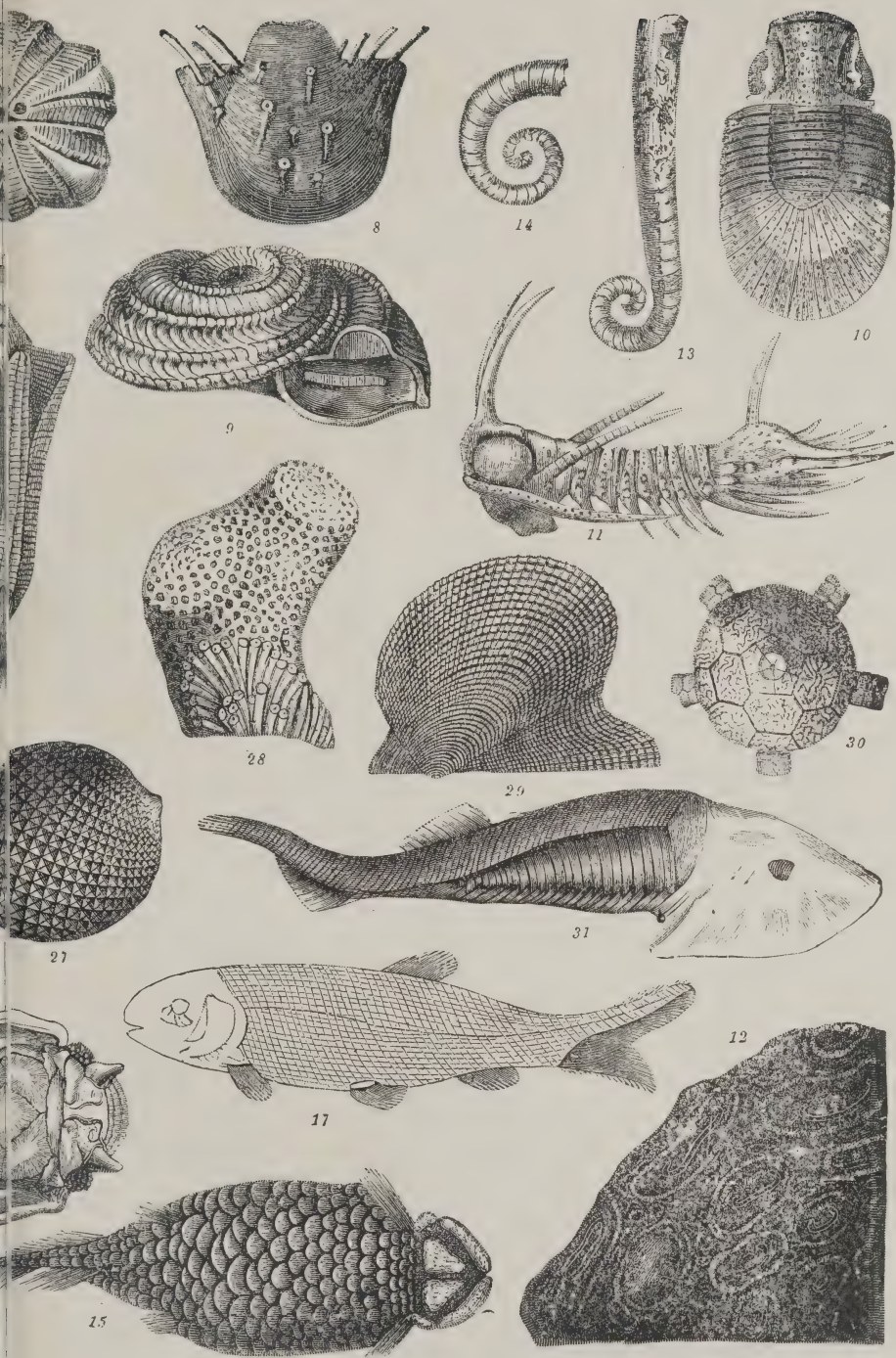
The subdivisions of the rocks of the period are the following:

UPPER SILURIAN ROCKS.

	Thickness in Feet.
<i>Upper Ludlow</i> —	
1. Downton Sandstone and Tilestones.....	80 to 1000
2. Upper Ludlow Shale.....	800
<i>Lower Ludlow</i> —	
3. Aymestry Limestone.....	150
4. Lower Ludlow Shale.....	900



SILURIAN AND DEVONIAN FOSSILS.—1, 5. *Spirifer speciosus*; *Spirifer calcaratus*. 2. *Goniatites*. 7. *Murchisonia angulata*. 8. *Productus aculeatus*. 9. *Enomphalus rugosus*. 10. *Enomphalus*. 14. *Enomphalus serpula*. 15. *Holoptychius nobilissimus*. 16. *Pentatremites ovalis*. 20. *Pterichthys latus*. 21. *Orthoceras literale*. 22. *Paradoxides Bohemicus*. 26. *Hypanthocrinus Buchii*. 27. *Receptaculites Neptuni*. 28. *Calamopora polymorpha*.



ites Buchii. 3. *Leptæna depressa*. 4. *Calymene Blumenbachii*. 6. *Oldhamia antiqua*.
 ites flabelifera. 11. *Arges armatus*. 12. *Tubicaulis solenites*. 13. *Phagmoceras lituites*.
 17. *Palæoniscus Freieslebeni*. 18. *Bellerophon primordialis*. 19. *Chonetes striatella*.
 3. *Catenipora labyrinthica*. 24. *Cyathophyllum flexuosum*. 25. *Clymenia undulata*.
 a. 29. *Avicula reticulata*. 30. *Melocrinus hieroglyphicus*. 31. *Cephalaspis Lyellii*.

	Thickness in Feet.
<i>Upper Wenlock—</i>	
5. Wenlock Limestone.....	300
<i>Lower Wenlock—</i>	
6. Wenlock Shale.....	1400
7. Woolhope Limestone and Denbighshire Grit.....	150
MIDDLE SILURIAN ROCKS.	
<i>Upper Llandovery—</i>	
8. Tarannon Shale.....	1000
9. May-hill Sandstone and Pentamerous Limestone.....	800
<i>Lower Llandovery—</i>	
10. Llandovery Slates.....	1000
LOWER SILURIAN ROCKS.	
<i>Caradoc—</i>	
11. Caradoc Sandstone.....	} 12,000
12. Bala Limestone.....	
<i>Llandeilo—</i>	
13. Upper Llandeilo.....	} 1500
14. Lower Llandeilo or Arenig Beds.....	
Contemporaneous Volcanic Rocks.....	5800

The typical Silurian strata are in Wales, and the adjoining English county, Shropshire. With the exception of the southern and south-eastern districts, where the old red sandstone and coal measures occur, the whole of Wales is composed of Silurian and Cambrian rocks. The same deposits are found in Cumberland and the n. of Lancashire. The whole of Scotland, s. of a line drawn from Dunbar on the e. to Girvan on the w., consists of graywacke rocks, slates, and limestones of Silurian age, with the exception of one or two small patches of old red, carboniferous, and pernian strata. The rocks, till recently referred to an azoic group, below the lowest fossiliferous strata in the n. of Scotland, are now generally believed to be highly altered beds of this period. The southern boundary of these beds is a line drawn from Stonehaven to Helensburgh. A huge trough, filled up with old red sandstone and carboniferous strata, separates the highly altered strata of the north from the less altered deposits of the south. An extensive region of Silurian rocks occurs in the south-eastern counties of Ireland and in Galway; and a great track of the same beds extends from the center of Ireland (Cavan, etc.) to the coast of Down. The metamorphic rocks of the north-west are most probably also of the same age as the corresponding strata in the n. of Scotland.

On the continent Silurian strata have been examined and correlated with the British types, in Bohemia, by M. Barrande; in Scandinavia by M. Angelin; and in Russia by Murchison and others. In North America, also, extensive regions are covered with these strata. They have been wrought out and their fossils described by the Canadian and United States surveyors. Similar strata have also been detected in India, Australia, and South America.

The life of the period presents a group of very characteristic organisms, which, with the exception of the fish-remains found in the upper beds, all belong to the invertebrata. Many of them are confined to the Silurian rocks, or occur only very rarely in some of the palæozoic formations. The graptolites are a strictly Silurian family of zoophytes, and most of the forms of trilobites are found only in this period, though some members of the tribe are found in rocks of Devonian and carboniferous age. Besides these may also be specified such forms as heliolites and favosites among the corals; actinocrinites and the cystidians among the echinoderms; orthids and lingula among the brachiopods; and litiutes and maclurea among the cephalopods.

In all the immense thickness of Silurian rocks no deposit has been discovered containing organisms that have lived on land. Some fragments have been noticed that have a faint resemblance to the branches of lepidodendron, and minute bodies occur in the bone-bed, which are referred to the spores of a terrestrial cryptogam. The only other indications of plants are impressions believed to have been produced by sea-weeds. The anthracitic shales of Wales and Scotland probably derived their anthracite from the algæ that must have abounded in the Silurian seas. In Shropshire a number of shells have been found, whose nearest allies are littoral species, and these appear to indicate the existence there of an ancient shore. The Silurian rocks are, however, generally sea deposits, and Forbes has ingeniously shown, from the small size of the conchiferæ, the paucity of spiral univalves, the great number of floating shells and of the pelagic orithidæ, and the great rarity, or absence except in the upper beds, of fossil fish, that it is most probable they were deposited, in a sea more than 70 fathoms deep.

The rocks of the lower Silurian division in North America embrace, I. the primordial, or Cambrian period, which again embraces the Acadian and the Potsdam epochs. II. Canadian period, which embraces the calciferous, the Quebec, and the Chazy epochs. III. Trenton period, embracing the Trenton, Utica, and Hudson river epochs. The upper Silurian embraces, I. the Niagara period, with Medina, Clinton, and

Niagara epochs. 2. Salina period, containing the Onondaga salt group. 3. Lower Helderberg period, containing the lower Helderberg limestone which includes in New York the water lime group, the lower pentamerous limestone, the delthyrs shaly limestone, and the upper pentamerous limestone. 4. Oriskany period, containing the Oriskany sandstone.

In the Acadian epoch the rocks are exposed to view in valleys in New Brunswick. They are gray and black shales with some sandstones, and have a thickness of 2,000 feet. In the Potsdam epoch in Labrador and Newfoundland are strata of limestones, sandstones, and shales from 5,000 to 5,600 ft. thick. In New York, Vermont, and Canada, rocks, lying upon the Archean, are hard sandstones, sometimes pebbly conglomerates. The sandstones are laminated, gray, drab, yellowish, brown, and red, often good building stone, as at Potsdam and Malone. In Clinton and St. Lawrence the conglomerate is often 300 ft. thick. In western Vermont there is red sandrock and Winooski limestone. Along the Appalachians the striking characteristic is the great thickness of the formation. In Pennsylvania there are in the primal series of Rogers 2,000 ft. of lower slates upon which rests 90 ft. of sandstone, and above this from 200 to 1000 ft. of upper slates. The pictured rocks on the s. shore of lake Superior, and the pillared rocks at the w. end of the lake are considered to be of Potsdam formation. The primordial rocks bear evidence only of marine life. The plants are chiefly fucoids. The animals are all invertebrates, as crinoids, brachiopods, pteropods, gasteropods, and cephalopods, worms and crustaceans, including trilobites (q.v.).

The rocks of the Canadian period appear at the surface in northern New York, Canada, northern Michigan, and Wisconsin; also in the Green mountains, the eastern Appalachians, from New Jersey southward, and in Missouri, Arkansas, and the Rocky mountains. The fossil flora and fauna of the Canadian period much resemble that of the primordial, but are more particularly rich in graptolites (q.v.). The earlier part of the Trenton period was particularly limestone-making. A broad belt of limestone of this period extends from eastern New York to Wisconsin, Minnesota, and Missouri, including the Galena limestone. It forms the bluffs at Trenton falls. The general thickness is from 100 to 500 ft., reaching 1000, and in Pennsylvania, 2,000 feet. The Utica shale comes to the surface in the Mohawk valley. Sea weeds are the only known fossil plants. Among the radiates are crinoids and star-fish, corals made their first appearance. Various mollusks were numerous, and among crustaceans trilobites were abundant. The strata are much upturned, some of them having a vertical position, others inclining from 10° to 90°, the greater part between 30° and 60°.

In the upper Silurian, the Niagara period contains Oneida conglomerates, in Oneida co., N. Y., the lower member of the Medina epoch, the upper being Medina sandstone. The conglomerate is 500 ft. thick in the Shawangunk mountains, where it is called Shawangunk grit. The rocks of the Niagara epoch are very extensive, occupying a large portion of the interior of the continent, and they are to a great extent limestones, this being also a limestone-making epoch. Near Niagara falls there are 165 ft. of limestone resting on 80 ft. of shale, and at the falls 85 ft. of limestone resting on 80 ft. of shale. Along the Appalachians the rocks have a thickness of 1500 feet. Niagara limestone occurs on the shores of Wellington and Barrow's straits and on King William's island, and common chain coral has been found in the Arctic regions. There is lead and copper in the Shawangunk grit in Ulster co. N. Y., and these metals are found in other Silurian rocks. Petroleum occurs in large quantities in Niagara limestone at Chicago, Ill., but is not easily worked. The only fossil plants are sea weeds. As to animals the sandstones of the Medina and Clinton groups contain the remains of many brachiopods and lamellibranchs, but only a few corals and crinoids. The Clinton and Niagara limestones, however, are rich in corals, crinoids, trilobites, and brachiopods, while there are but few lamellibranchs or muddy bottom mollusks. The fine sandy and clayey character of the Medina beds shows that at the time of their deposition central New York was an extensive area of low, sandy sea shores, flats and marshes, not exposed to heavy waves, and that a similar condition extended westward to Michigan. The beds of the Niagara epoch bear evidence of having been formed in deep seas, from the thickness of the limestones in the Mississippi basin and elsewhere. After the elevation of the Green mountains, according to Dana, there was a gradual sinking which moved the coast line eastward to the Hudson, so that over New York and the interior basin there was a vast limestone-making sea. At the same time there was another large sea in the St. Lawrence region. In the course of these oscillations, from the beginning of the Trenton to the close of the Niagara period there was a deposition of 12,000 ft. of rock along the Alleghanies.

SILURIDÆ, a family of malacopterous fishes, divided into many genera, and including a great number of species, mostly inhabitants of the lakes and rivers of warm countries. The siluridæ exhibit great diversity of form. Their skin is generally naked, but some have a row of bony plates along the lateral line, and a few are completely mailed with bony plates. The dorsal fin is single in some; others have two dorsal fins, the second being sometimes adipose, as in the salmon family. The dorsal fin is sometimes armed with a strong spinous ray, and in most of the family the first ray of the pectoral fins is very strong and serrated, so as to be capable of inflicting a severe wound, and by

this these fishes are protected from alligators and other enemies. All have the mouth furnished with barbels, more or less numerous; the two principal barbels being on the upper lip, and formed by elongation of the intermaxillary bones. The barbels are believed to be organs of touch, probably of use in directing the fish to its prey. The bones of the head and other parts of the skeleton exhibit many peculiarities, into which we cannot enter. The siluridæ are generally inhabitants of muddy rivers, lurking among the mud. The only European species is the *SLY SILURUS*, SHEAT-FISH, or SHADEN (*silurus glanis*), the largest of European fresh-water fishes, and sometimes found in the sea near the mouths of rivers. It does not inhabit any of the rivers of Britain; its introduction has, however, recently been attempted. Neither is it found in France, Spain, or Italy, but it is plentiful in the Danube, the Elbe, and their larger tributaries, also in the rivers which fall into the Caspian sea; and it is found in some of the rivers of North America. It attains a length of six or even eight feet, and a weight of 300 or 400 pounds. The flesh is white and fat, but soft, luscious, and not very easily digestible. In the northern countries of Europe it is preserved by drying, and the fat is used as lard. The habits of the fish are sluggish. It seems rather to lie in wait for its prey than to go in quest of it.—Several species of this family are found in the Nile, among which is the *HARMOUTH* or *KARMOOT* (*clarias anguillaris*), a fish in its general form and appearance much resembling that just described. It was anciently an object of superstitious regard in the Thebaid.

SILVAS, or **SELVAS** (Span. *selva*, a forest), the name given to the western portion of the great plain of the Amazon, in the n.w. of Brazil. The silvas, which are about one-third of the whole plain, contain more than 700,000 English sq.m., and consist of low land on a dead level, densely covered with primeval forests, and annually inundated by the overflow of the mighty river or its tributaries. The forests are rendered wholly impenetrable from the denseness of the underwood, matted together as it is by creeping and climbing plants which form myriads of festoons glowing with nature's brightest tints. The vegetation of the silvas, under the stimulating action of the abundant irrigation, the intense tropical heat, and the inconceivable richness of the alluvium which constitutes the soil, shows an exuberance of growth far surpassing that of any other portion of the earth's surface, and from its very luxuriance presents a bar to civilization no less effectual than do the barren deserts of Africa or the gloomy wastes of central Asia. The few Europeans who have penetrated into this region have sailed up the Amazon and some of its tributaries, and from them we have received the little knowledge that we do possess of this immense tract of wild forest. It is the haunt of innumerable wild animals, especially monkeys and serpents, and of a few aboriginal inhabitants who are sunk in the lowest stage of barbarism.

SILVER (symb. Ag, equiv. 108, sp. gr. 10.53) is a metal which, in its compact state, is of a brilliant white color, possesses the metallic luster to a remarkable degree, is capable of being highly polished, and evolves a clear ringing sound when struck. It is harder than gold, but softer than copper, and is one of the most ductile of the metals. It is malleable, may be hammered into very thin leaves, and may be drawn out into very fine wire, the thinnest silver-leaf having a thickness of only $\frac{1}{100000}$ of an inch, and one grain of the metal being capable of yielding 400 feet of wire. It possesses a high degree of tenacity, a wire with a diameter of $\frac{1}{16}$ of an inch being able to support a weight of nearly 188 pounds. It requires a heat of 1904° F. (1040° C.) to fuse it, and on cooling it expands at the moment of solidification. It is an excellent conductor of heat and electricity, and is not affected by exposure, even to a moist atmosphere at any temperature. When, however, it is fused it absorbs a considerable quantity of oxygen which it expels in the act of solidification with a peculiar sound technically known as *spitting*.* But although it does not rust or become oxidized it usually becomes tarnished on prolonged exposure to the air, owing to the formation of a film of sulphide (or sulphuret) of silver, and this change occurs more rapidly in towns than in the country in consequence of sulphureted hydrogen being more abundant in the atmosphere of the former than of the latter. This metal is unaffected by the hydrates or nitrates of the alkalies, even at a high temperature, and hence silver crucibles, etc., are highly useful in many laboratory operations.

Hydrochloric and dilute sulphuric acid have scarcely any action on silver, but nitric acid and boiling sulphuric acid oxidize it, and form salts; nitric acid being by far its best solvent. Silver has strong affinities for chlorine, bromine, iodine, fluorine, and sulphur, and forms definite compounds with them. It is well known that common salt, especially in the melted state, when left for any time in contact with silver, corrodes that metal, soda being formed from the oxygen of the air, while the liberated chlorine attacks the silver.

Silver is frequently met with in the native state crystallized in cubes or octahedrons, or occurring in fibrous masses. It is also found in combination with gold, mercury, lead, antimony, arsenic, sulphur, etc., and sulphide of lead is almost always accompanied with a greater or less amount of sulphide of silver; it is, however, never found as an oxide.

Silver forms three compounds with oxygen—viz., silver tetrantoxide, Ag_4O ; silver

* Although ordinary air has no oxidizing action on silver, ozonized air rapidly attacks it.

hemioxide or silver oxide, Ag_2O ; and silver peroxide or dioxide, Ag_2O_2 . All these oxides possess the common properties of being reduced by heat to the metallic state, and of being very readily decomposed by the action of light. The oxide, Ag_2O , is the only one of these compounds requiring special notice. It is a dark-brown heavy powder, devoid of taste or smell, slightly soluble in water, to which it communicates a metallic taste and an alkaline reaction. It acts as a powerful base, neutralizing the strongest acids, and forming normal salts with them. It is obtained by the addition of a solution of potash to a solution of the nitrate or any other soluble salt of silver, falling as a hydrated oxide, which, at a temperature above 140°F . (60°C .), becomes anhydrous. If a concentrated solution of ammonia be digested for some hours upon freshly precipitated oxide of silver, fulminate of silver (q.v.), or fulminating silver in the form of a black powder, is produced, and the same dangerous compound is formed when an ammoniacal solution of nitrate or chloride of silver is precipitated by potash.

The salts which the oxide of silver forms with acids are characterized by the readiness with which they decompose, the mere action of light blackening and partially reducing them. None of these salts occur in nature. The following are the most important of those which have been formed artificially:

Nitrate of Silver, AgNO_3 , crystallizes in large, colorless, transparent square tablets, which blacken on exposure to light, or in contact with organic matters, owing to reduction, and dissolve in their own weight of cold water. This property of producing a permanent black color with organic matters has led to its employment as a *marking ink** for linen, etc. The black stains which it forms on the skin, on linen, etc., may be removed by the employment of a strong solution of iodide of potassium, or more readily by a solution of cyanide of potassium. The crystals fuse at a temperature of about 392°F . (200°C .), and the molten mass, when cast into cylindrical molds, solidifies, and forms the sticks of *lunar caustic* which are employed in surgery, medicine, and photography (q.v.). Nitrate of silver is prepared by dissolving pure silver in moderately strong nitric acid, and evaporating till the solution is sufficiently concentrated to crystallize. "The most characteristic test for the salts of silver is the action of hydrochloric acid, or of a soluble chloride, which produces a white curdy precipitate of chloride of silver, insoluble in nitric acid, but readily soluble in ammonia; it is also soluble in hyposulphite of soda, with which it forms an intensely sweet solution; cyanide of potassium also dissolves it; the chloride of silver speedily assumes a violet tinge when exposed to light."—Miller's *Elements of Chemistry*, 2d ed., vol. ii. p. 732.

Of the haloid salts of silver, several occur native. The most important of these compounds is *chloride of silver*, AgCl , which is found native either in cubes or in a dense semi-transparent mass, and is known as *horn silver*, and may be procured as a dense white flocculent precipitate by the procedure described in the preceding paragraph. In consequence of its sensibility to light, it is employed in photography. When heated to about 842°F . (450°C .), it fuses into a yellow fluid, which, on cooling, solidifies into a yellowish-gray semi-transparent horny mass. This salt is insoluble in water and in all the diluted acids, but dissolves in a solution of ammonia, from which it crystallizes in octahedra. Its solution in a solution of hyposulphite of soda is employed in silvering iron, copper, and brass goods. Traces of this salt are found in sea-water, the chloride of sodium probably acting as the solvent. *Bromide of silver*, AgBr , is found in Mexico, where it is known as *plata verte*, or green silver, in the form of small crystals or crystalline granules of a pale olive-green tint. *Iodide of silver*, AgI , occurs native in several Mexican mines in the form of thin, flexible, pearly scales.

Sulphide (or sulphuret) of silver, Ag_2S , is the principal ore of silver. It occurs native, sometimes crystallized in cubes or octahedra, and sometimes in masses. From its gray metallic luster, it has received from mineralogists the name of *silver glance*. It is well known that if silver spoons are allowed to remain in contact with boiled eggs for some time, they become tarnished by the action of the sulphur; a minute quantity of sulphureted hydrogen being probably evolved. The discoloration is easily removed by washing the darkened silver with a solution of cyanide of potassium. Sulphide of silver unites with various other metallic sulphides when fused with them, especially with the sulphides of arsenic and antimony. *Red silver ore*, Ag_3SbS_3 , is a native compound of this kind.

The alloys of silver and copper (see ALLOY and MINT), when cast into ingots, are usually found to differ in their composition in the internal and external parts, in consequence of a molecular change that takes place during the cooling and slow solidification of the molten mass. In bars containing more than 719 parts of silver in 1000, the central portions are richer in silver than the exterior; in alloys of less value, the reverse is observed, while in ingots containing 950 or more parts of silver in 1000, the composition is nearly uniform throughout. When exactly 719 parts of silver and 281 of copper are combined (corresponding to the formula $\text{Ag}_7\text{Cu}_{281}$), no separation whatever of the metals occurs. Many metals, as tin, zinc, antimony, bismuth, arsenic, etc., when

* Brande gives the following directions for preparing marking ink: Dissolve two drams of nitrate of silver and one dram of gum-arabic in seven drams of water, and color the liquid with Indian ink. The cloth must be first prepared by moistening the spot with a few drops of a soda solution, prepared by dissolving two ounces of crystallized carbonate of soda and two drams of gum in four ounces of water. Professor Miller recommends as a cheap indelible marking ink, a solution of coal-tar in naphtha; it resists the action of chlorine, and is used by bleachers to mark their goods.

mixed with silver, render it brittle and unfit for its ordinary uses; they are, however, easily removed in the process of refining. An alloy consisting of 5 parts of silver, 6 of brass, and 2 of zinc, is used as a solder for silver. An alloy of silver and mercury, known as *silver amalgam*, occurs native in a crystallized form. It is a mineral of a silvery white color, and its composition is represented by the formula, AgHg_2 .

Silver, like gold, has been known and prized from the earliest ages. The silver mines of Mexico were, until quite recently, by far the richest known to exist. Their estimated annual yield is about 1,600,000 lbs. troy of the pure metal. Until the remarkable discoveries of silver ore in Nevada and adjoining states in 1859 and 1860, Chili and Peru had long stood next to Mexico in their yield, each furnishing about one-sixth of the produce of that country. Bolivia is also rich in silver; but the recent extraordinary development of silver mining in the western regions of the United States, appears to have raised their produce to at least a par with that of Mexico, so that these two countries now furnish three-fourths of all the silver obtained in the world.

Of European countries, Germany is the most productive. The richest Spanish mines are those of Huelmo, in the province of Guadalupe, which were first extensively opened in 1846. These have yielded immense wealth, but their produce has much declined since 1858. Silver glance is the principal ore, although several others are found, including quantities of the formerly rare mineral freieslebenite, which contains about 23 per cent. of silver. Next to Germany, Spain, France, Austria-Hungary and the United Kingdom yield the largest supplies. The silver mines of Kongsberg in Norway are likewise valuable, and have been long famous. Great Britain has no silver mines, properly so called, but since the introduction in 1829 of Pattinson's process for the desilverizing of lead smelted from argentiferous galena, a large quantity has been annually produced in this way. The highest yield of silver by this process was in 1868, and amounted to 841,328 ounces, but owing to the gradual decline since then in the produce of British lead, the silver obtained from it had fallen in 1880 to 295,518 ounces (see LEAD). In the mineral veins of Cornwall, some "bunches" of true silver ore have occasionally been found, but of limited extent.

The forms in which silver is found in nature are numerous, but we need only notice a few of them. It is frequently found native in crystalized and amorphous masses, which are sometimes of considerable size. One fine piece found at Königsberg is now in the Copenhagen museum, and weighs 500 lbs. But the quantity of silver found in nature in the metallic state is comparatively small. Its principal ores are the different sulphides or sulphurets, viz., silver glance, or sulphuret of silver, containing when pure 87 parts of silver and 13 of sulphur; brittle silver ore, or sulphuret of silver and antimony, of which the composition is, silver 68.5, antimony 14.7, and sulphur 16.4; and red silver ore, called also ruby silver, of which there is a dark and a light kind, the composition of the former being similar to brittle silver ore, but it is a little less rich in silver, and the latter only differs in containing arsenic instead of antimony. The bulk of the silver obtained in Mexico and South America is got from these ores. The only other of much importance, except the mixed ores to be presently noticed, is horn silver, or chloride of silver. In a pure state, it consists of silver 75, and chlorine 25. It occurs extensively in Mexico and Peru, but is not common in European mines.

Beside the ores named above, a good deal of the silver of commerce is obtained from mixed ores, that is, the ores of other metals are frequently found to contain it. In many cases, the amount of silver falls greatly short of one per cent. These ores are for the most part sulphurets of lead, arsenic, copper, zinc, and iron.

In the reduction of silver ores, the processes followed are based upon the fact, that both lead and mercury have a strong affinity for silver. A more recent process depends upon the solubility of chloride of silver in a hot solution of common salt, and its separation again on cooling.

The simplest process is ordinary smelting, and is only applied to the richest ores. These are crushed, mixed with old slag, lead in some form, and a little iron ore and lime. The mixture is then heated in a furnace with charcoal, which brings down the silver and lead together as an alloy. The silver is afterward easily separated by cupellation, the principle of which is described in the article ASSAY; but on the large scale, instead of a small bone ash cupel, a cupellation furnace, say 6 feet in diameter, is used. Here the alloy is melted, bellows are used to remove the lead as litharge, or oxide of lead, and a cake of silver is left on the cupel forming the bottom of the furnace.

It happens that not many even of the richer ores are pure enough to be treated with advantage by simply roasting them with lead; accordingly, another plan, called the amalgamation process, is more commonly adopted. The following is an outline of the way in which this is practiced at Freiberg in Saxony. The vein stuff (largely silica), containing a mixed ore of lead, copper, zinc, etc., as sulphurets, and only from 3 to 3½ oz. of silver per cwt., is ground to powder as described under METALLURGY; but some sulphuret of iron is also present, or must be added. About ten per cent of common salt is then mixed with the ore, and the mixture heated in a reverberatory furnace (q.v.) to a temperature sufficient to expel water, and in part arsenic, zinc, and antimony. After two hours, the sulphur of the sulphurets takes fire, and is burned off as sulphurous acid, or converted into sulphuric acid, so that the metals become oxides and sulphates. The temperature of the furnace is now raised, when the chlorine of the common salt forms

volatile chlorides with zinc, antimony, and iron, and a fixed chloride with silver. During the roasting, the contents of the furnace are continually stirred, so that they ultimately form a coarse powder.

The product of the roasting furnace, after being ground to a fine powder, is mixed in the proportion of 10 cwt. with 3 cwt. of water and 1 cwt. of iron in fragments; the mixture being effected in oak casks, which are then made to revolve for two hours on their axes. During the operation the iron decomposes the metallic chlorides in the roasted ore, forming chloride of iron, while the copper is partly reduced to subchloride and partly to metallic copper. If there is not enough iron present to convert the copper into subchloride, then mercury will be wasted in the next stage by conversion into its subchloride. Quicksilver to the amount of 5 cwt. is next run into each of the casks, which are then set in motion, and continue for 22 hours at the rate of 12 revolutions per minute. The result of this is, that the silver being precipitated by the presence of metallic copper, is then dissolved by the mercury, but the amalgam so formed is usually a complex one.

In order to separate the amalgam from the earthy matters and the sulphates and chlorides, the barrels, which were hitherto only two-thirds full, are now filled with water (the dilution throwing down any chloride of silver held in solution by the sea-salt), and kept revolving for two hours; after which, by means of a stop-cock, the amalgam is allowed to flow into the amalgam chamber, and the rest of the contents, except the iron fragments, into a wash tun. The superfluous quicksilver has next to be separated from the amalgam. This is done in bags of ticking, through which the mercury at first flows readily by its own weight, and is afterward squeezed out on a flat surface. The result of this operation is, that the amalgam of mercury, silver, copper, etc., is left in the bags: its actual composition being nearly 85 per cent of mercury, 10 per cent of silver, and 5 of copper, lead, and antimony. Finally, the quicksilver of the amalgam itself is separated by heat in a distilling furnace. Here the amalgam is put into a row of iron pots, which go into a large retort. When heat is applied the quicksilver volatilizes, and is condensed in a pipe attached to the retort, from which it is collected in a trough. The impure silver left in the retort is refined by fusion and subsequent cupellation.

In another process formerly carried on at Freiberg and elsewhere, the use of mercury is dispensed with. It consists in treating the ore as above described till it leaves the roasting-furnace. At this stage the roasted ore is digested in a warm concentrated solution of sea-salt, which readily dissolves the chloride of silver. The solution is then passed through wooden tubs containing metallic copper, which has the property of decomposing the chloride of silver; the chlorine unites with the copper to form chloride of copper, and the silver is precipitated.

The number of methods which have been used for the separation of silver from its ores and for refining it are far too numerous to include in this article, but many of them are refinements of the methods just described.

In Mexico, where indeed the process was first introduced, the extraction of the silver from its ores is chiefly accomplished by amalgamation, but the plan employed differs a good deal in its details from the Saxon method described above. Of late years the sodium-amalgam process of Mr. Crookes has been used with advantage for the extraction of silver in several American mining districts.

It has now become a common practice at Swansea, where the great British copper-smelting works are situated, to extract the silver which exists in an appreciable, though small quantity, in many copper ores. By one process copper smelted from an argenteriferous ore is melted with three or four times its weight of lead, and cast into ingots. When these are moderately heated, the copper does not fuse, but the lead and silver melt, and run off together, and the silver is then separated by cupellation. From the burnt pyrites of vitriol works, so recently a waste product, not only is the iron and copper, but the silver, which exists in exceedingly small proportion, is now recovered by the use of iodide of potassium.

The physical and chemical properties of silver are such as make it specially valuable for many purposes in the arts; the chief of which are noticed in the articles ALLOY, MINT, PLATING, GALVANISM, and PHOTOGRAPHY. Ordinary mirrors have their *silvering* produced by a coating of an amalgam of tin and mercury; but for some years, mirrors coated by a patent process with real silver, and backed by a layer of some composition, which protects it from the blackening action of sulphureted hydrogen, have been made in great numbers.

MEDICINAL USES OF SILVER. *Nitrate of silver*, in small doses, constitutes an excellent tonic, and it appears to exert almost a specific influence over certain convulsive diseases. As a tonic, it is frequently prescribed in the early stages of phthisis, and in cases of irritability of the mucous membrane of the stomach; and epilepsy and chorea frequently yield to its influence, when many other remedies have been tried in vain. There is unfortunately one great drawback to its administration—viz., that when its use has been continued for some time, this salt communicates a permanent slate-like or bluish-gray hue to the skin. There is very little danger of this change of color occurring, if the medicine is not administered for a longer period than three months. In prescribing this salt, it is usual to begin with a small dose, about one-sixth of a grain, and gradually to

increase it to two or three grains, three times a day. It is best administered in pills made with some vegetable extract. The surgical uses of nitrate of silver have been already noticed in the article on LUNAR CAUSTIC.

Oxide of silver is employed in the same cases as the nitrate. It is especially recommended in chronic affections of the stomach, and in menorrhagia. It may be given in the same doses as nitrate. *Chloride of silver* has been employed both in America and in Germany in the same cases as the nitrate, and in certain forms of syphilitic disease. It is stated not to produce the discoloration of the skin caused by the nitrate; but as the same statement was confidently made regarding the oxide, and was found to be fallacious, we are not inclined to put any faith in this assertion, especially as the nitrate must be at once converted into a chloride by the free hydrochloric acid of the gastric juice. The now great silver-mining industry of the United States had no existence before 1860. While, before that date, it was well known that a few ounces of silver could be extracted from a ton of almost any of the American galena ores; and while silver in combination with lead had been found in some instances, and in Davidson co., N. C., a mine had been worked with some activity for argentiferous galena, and a little silver had been found in the gold of California, there had been no discovery made in this direction which in the least indicated the vast possibilities of American silver production. The prospectors and pioneers who traversed Arizona, Idaho, Nevada, Colorado, and other territories in the far west, seeking for gold, in the years between 1850 and 1860, fell upon silver unexpectedly. The greatest silver mine ever known was discovered in this way in 1858-59, in the Washoe country, on the eastern foot-hills of the Sierra Nevada. This was the celebrated "Comstock" mine, which was found by James Shinney and Henry Comstock, both of whom parted with their interest for a trifle, not discerning the value of the discovery. The Comstock lode is situated in Storey co., Nevada, 25 m. from the w. border of the state, and 20 m. from Reno, on the Union Pacific railroad. A portion of the mine was worked in 1860-61, and by 1865 it had yielded to the value of \$30,000,000; and a city of 20,000 inhabitants was planted on its site. See VIRGINIA CITY. From 1859 to 1866 the total product of the mines on the Comstock lode was about \$70,000,000. The tremendous result of this discovery encouraged further prospecting, and it was soon found that the mountains of Colorado were full of similar veins; Idaho and Montana became in their turn silver-bearing territory; and the Wasatch range, looking down into the Salt Lake valley, was found to be rich in silver-bearing lodes. Up to Dec., 1878, the value of the silver yield of Colorado was about \$16,000,000. Two years later, the mines of Leadville alone, not discovered till 1877, yielded as much. The effect of the increased production of silver has been marked and important. From authoritative sources it is known that the exportation of the metal from countries w. to countries e. of Egypt, which was \$20,000,000 in 1873, had increased in 1877 to \$100,000,000. The mining fever of 1865-70 produced its inevitable result of calamity in 1873, which the discovery of the great "Bonanza" of the California and Consolidated Virginia only temporarily lulled. The interest in silver mines fell off with the bursting of bubble companies, and it was not until the remarkable Colorado discoveries had been fully authenticated in 1878-79, that a fresh enthusiasm brought silver-mining again into repute. See BIMETALLISM; CURRENCY; LATIN UNION; MINING; MINING CORPORATIONS; MONETARY COMMISSION; MONETARY CONFERENCE; MONEY. The following table gives the world's production of silver in 1895 and 1896.

COUNTRY.	1895.		1896.	
	Fine Ounces.	Commercial Value.	Fine Ounces.	Commercial Value.
United States.....	46,331,235	\$30,254,296	58,488,810	\$39,245,991
Canada.....	1,775,683	1,159,278	3,205,243	2,150,785
Mexico.....	50,890,267	33,225,091	41,373,835	27,761,843
Central America.....	1,607,500	1,049,500	1,623,575	1,089,285
Argentine Republic.....	1,212,625	787,125	1,197,588	803,483
Bolivia.....	20,767,852	13,500,000	20,511,700	13,762,660
Chile.....	4,822,500	3,148,500	4,870,725	3,267,855
Colombia.....	1,720,025	1,122,965	1,646,080	1,104,384
Ecuador.....	7,716	5,037	7,716	5,177
Peru.....	3,697,250	2,215,850	3,381,569	2,268,654
Austria-Hungary.....	1,816,475	1,185,935	1,840,588	1,234,882
France.....	3,102,475	2,025,535	3,076,363	2,065,328
Germany.....	12,602,125	8,227,689	13,774,992	9,241,213
Italy.....	1,768,250	1,154,450	1,808,438	1,213,312
Norway.....	146,216	101,990	151,748	101,810
Russia.....	389,272	254,147	336,128	225,514
Spain.....	7,426,650	4,848,690	7,166,235	4,807,953
Sweden.....	93,238	60,871	94,048	63,002
Turkey.....	49,059	33,821	49,029	32,894
United Kingdom.....	253,985	165,821	155,593	171,482
Japan.....	1,768,250	1,154,250	1,816,475	1,218,705
Australasia.....	19,971,580	13,038,988	19,463,610	13,058,478
Totals.....	182,220,228	\$119,027,829	186,042,188	\$124,894,760

The average value of silver in 1895 was 65.3 c. per Troy oz. and 67.1 c. in 1896. For an account of silver in its economic relations to finance, see BIMETALLISM.

Annual coining value of silver produced in the United States, 1849-1895:

YEAR.	SILVER.	YEAR.	SILVER.
1849.....	\$50,000	1873.....	\$35,750,000
1850.....	50,000	1874.....	37,324,594
1851.....	50,000	1875.....	31,727,560
1852.....	50,000	1876.....	38,783,016
1853.....	50,000	1877.....	39,793,573
1854.....	50,000	1878.....	45,281,385
1855.....	50,000	1879.....	40,812,132
1856.....	50,000	1880.....	38,450,000
1857.....	50,000	1881.....	43,000,000
1858.....	500,000	1882.....	46,800,000
1859.....	100,000	1883.....	46,200,000
1860.....	150,000	1884.....	48,800,000
1861.....	2,000,000	1885.....	51,600,000
1862.....	4,500,000	1886.....	51,000,000
1863.....	8,500,000	1887.....	53,357,000
1864.....	11,000,000	1888.....	59,195,000
1865.....	11,250,000	1889.....	64,646,000
1866.....	10,000,000	1890.....	70,465,000
1867.....	13,500,000	1891.....	75,417,000
1868.....	12,000,000	1892.....	82,101,000
1869.....	12,000,000	1893.....	77,576,000
1870.....	16,000,000	1894.....	64,000,000
1871.....	23,000,000	1895.....	72,051,000
1872.....	28,750,000		

SILVER AGE. See AGES.**SILVER BOW**, a co. in Montana; formed 1884; pop. '90, 23,744; area, 915 sq. m. Co. seat, Butte.**SILVER CLIFF**, a precinct and town in Custer co., Col.; 30 miles s.w. of Canon City; once noted for its great silver interests. Pop. '90, town, 546.**SILVER COINAGE.** See BIMETALLISM.**SILVERING GLASS.** See MIRROR.**SILVERSIDE** or **SILVER-FISH.** See ATHERINE.**SILVER WEDDING.** See WEDDING ANNIVERSARIES.**SIMBIRSK'**, a government of Russia, bounded on the e. by the Volga, and on the w. by the governments of Nijni-Novgorod and Panza. Area, 19,110 sq. m.; pop. '92, 1,667,542. The surface is for the most part level, and the soil of remarkable fertility, and there are excellent and extensive meadows and pasture grounds. There is a variety of manufactures, including ship-building. The fisheries and the commerce on the Volga, and cattle-breeding are important.**SIMBIRSK**, capital of the Russian government of the same name, on the right bank of the Volga 576 m. e.s.e. of Moscow. Leather, soap, and candles are manufactured, considerable trade is carried on by the Volga, and there is a famous annual fair. During the years 1864 and 1865 Simbirsk suffered severely from fires. Pop. '92, 39,723.**SIMCOE**, a co. in Ontario, Canada, lying principally between lake Simcoe and Georgian bay; intersected by the Grand Trunk railroad; area, 1951 sq. miles; pop. '91, 84,828. Co. seat, Barrie. The principal industries are lumbering and shipping.**SIMCOE, JOHN GRAVES**, 1752-1806; b. England, son of a capt. in the navy; killed at the siege of Quebec; was ensign in the army, 1770; a tory during the revolutionary war; raised and commanded the queen's rangers with the rank of lieutenant-col. He was wounded at the battle of the Brandywine and at Monmouth; was with Cornwallis at Yorktown. He wrote the history of the exploits of his battalion; was governor of upper Canada, 1791-94, governor of St. Domingo, 1796-97; lieutenant-gen., 1798; died in England. Lake Simcoe in Ontario was named in his honor. A journal of his campaigns was published for private circulation.**SIMCOE, LAKE**, in Ontario, Canada, having the counties of Ontario and York on the s. shore, Simcoe co. and the river Severn on the north. It is 30 m. long, 18 m. wide, and 170 ft. above lake Huron, into which it discharges through the Severn, lake Couchiching, and Georgian bay. White fish are found abundantly, and on Snake island is an Indian reservation. The margins are covered with thick forests. In the winter it is so solidly frozen as to be a serviceable highway.**SIMEON**, Rev. CHARLES, an eminent evangelical preacher of the English church, was b. at Reading in Berkshire, Sept. 24, 1759. Educated at Eton and Cambridge, he was ordained a priest in 1782. His first religious impressions occurred during his residence at the university, and produced a permanent change in his character. From being a somewhat vain and dressy young gentleman, he passed into an ardent and zealous preacher of the cross, and this he remained during the 54 years of his public ministry.

His career was not marked by many incidents. Appointed vicar of Trinity church, Cambridge, in the year of his ordination, and vice-provost of his own college (King's) in 1790, he continued to hold these offices to the close of his life, Nov. 13, 1836. As a preacher Simeon was distinguished for an impassioned evangelicalism in language, sentiment, and doctrine, that at first roused against him a bitter and protracted opposition. His earnestness, however, met with its due reward. Friends and followers sprang up; and in course of time Simeon became a center of evangelical influence, that began to spread itself over the whole church, and gave birth to its great missionary activity in recent years. Simeon may even be regarded as the founder of the "Low-church" party, and on the whole, fairly represents their earnestness, dogmatism, mediocre intellect, and limited scholarship.

SIMEON STYLITES. See **PILLAR-SAINTS**.

SIMEONI, HIS **EMINENCE GIOVANNI**, Italian Cardinal, was born at Paliano, July 23, 1816, and after his ordination to the priesthood, on account of his learning, was employed in important offices. In 1847 he was auditor of the nunciature of Madrid, and later Prefect of Studies in the Pontifical Lyceum of the Roman Seminary at Rome. He was for many years Secretary of the Congregation of the Propaganda, and belongs to the Holy Roman and Universal Inquisition, and to the Council for the Revision of Provincial Councils and Extraordinary Ecclesiastical Affairs. He was sent in 1875 by Pius IX as Nuncio to Madrid, having just been made Archbishop of Chalcedonia. He was created Cardinal on March 15, 1875, and in 1876, on the death of Cardinal Antonelli, was appointed Secretary of State to the Pope and Prefect of the Sacred Apostolic Palaces. He was succeeded as Secretary of State by Cardinal Franchi in 1878, when he was appointed Prefect of the Propaganda by Pope Leo XIII. Died Jan. 14, 1892.

SIMFERO'POL, a t. of Russia, in the Crimea, capital of the government of Taurida, stands on the Salghir, 45 m. n.e. of Sevastopol. The valley of the river is studded with charming villas, and the town is surrounded by gardens, and has a picturesque appearance. The older part comprises the old Tartar town of Ak-Metchet or White Mosque; the new part, containing the government buildings, is very handsome. Fruits are largely grown in the vicinity, and exported. Pop. (1892) 45,547.

SIM'IA AND SIMI'ADÆ. See **MONKEY**.

SIMILAR FIGURES, in geometry are figures which exactly correspond in shape, but may or may not be of the same size. If the figures be rectilinear, then the criterion of similarity is that every pair of corresponding sides should have the same ratio to each other, and that each angle of the one figure should be equal to a corresponding angle of the other. If the figures be triangular, the proportionality of the sides carries with it the equality of the angles, and *vice versâ*, but only in this case. *Similar segments of circles* are those in which, and on whose bases similar triangles can be inscribed; or as it is otherwise expressed, those which contain equal angles—a satisfactory test that they are each the same part of their respective circles. *Similar solids* are those which are bounded by similar planes similarly situated to each other. All similar plane figures are to one another as the squares of any corresponding sides, and all similar solids are as the cubes of their corresponding sides.

SIMLA, a British district in the n.w. of India, about 170 m. in direct line n. of Delhi. It consists of a number of houses irregularly scattered over a mountain ridge, with a noble panorama expanding on all sides of it. European fruits and vegetables are successfully cultivated, and the climate is salubrious. There are exports of opium, fruit and shawl wool. Area, 18 sq. m. Pop. '81, 42,945.

SIMMS, **WILLIAM GILMORE**, American author, was born at Charleston, S. C., April 17, 1806, of Irish extraction. He made verses at the age of 7; and during the war of 1812, celebrated in rhyme the exploits of the American army and navy. Left in charge of his grandmother at Charleston, he was placed with a druggist; but at 18 began the study of law; was admitted to the bar at 22; published *Early Lays* and *Lyrical and Other Poems* (1827), and became (1828) editor of *The City Gazette*, and published *The Vision of Cortes*, *Cain* and *Other Poems* (1829), and *The Tri-Color*, a poetical glorification of the French revolution (1830). In 1832, his paper, opposing nullification, failed; and he lost his wife, father, and grandmother, and took refuge in New England, where at Hingham, Mass., he wrote his best poem, *Atalanta, a Story of the Sea* (1833); and the same year *Martin Faber*, the story of a criminal. From this time he poured out rather than wrote poems, novels, histories, and biographies in rapid succession, which may best be classed in groups. Of poems, he published *Southern Passages and Pictures* (1839); *Donna Anna* (1843); *Grouped Thoughts and Scattered Fancies* (1845); *Lays of the Palmetto*—ballads of southern heroism in the war with Mexico (1848); *Poems, Descriptive, Dramatic, and Legendary* (1854); *Aretyos, or Songs and Ballads of the South* (1860). Of dramas—*Norman Maurin, or the Man of the People*; *Michael Bonham, or the Fall of the Alamo*; and a stage adaptation of *Timon of Athens*. Of prose romances of the imagination—*The Book of My Lady* (1833); *Carl Werner* (1838); *Confession, or the Blind Heart* (1842); *Castle Dismal* (1845); *The Wiggam and the Cabin*, two series (1845, 1846); *Marie de Bernière* (1853). Of historical romances—*The Yemassee* (1835); *Pelayo* (1838); *Count Julien* (1845); *The Damsel of Davien* (1845); *The Lily and the Totem, or the Huguenots in Florida* (1845); *The Moor and Other Tales* (1855); *Vasconcelos* (1857); *Cassique of Kiawah* (1860). Of revolutionary stories—*The Partisan* (1835); *Mellichamp* (1851); *Katherine*

Walton (1851); *The Scout* (1841); *The Kinsman, or the Black Riders of the Congaree* (1841); *Woodcraft* (1855); *The Foragers* (1855); *Eutaw* (1856); these five being stories of the war in the Carolinas. Of local tales—*Guy Rivers* (1834); *Richard Hurdis* (1838); *Border Beagles* (1840); *Beauchamps* (1842); *Helen Halsey* (1845); *The Golden Christmas* (1852); *Charlemont* (1856). His other works comprise a *History of South Carolina*; *South Carolina in the Revolution*; *Lives of General Marion, Captain John Smith, Chevalier Bayard, General Greene*; *Civil War in the South*; *American Loyalists of the Revolution*; *Views and Reviews of American Literature*; *The Morals of Slavery*, etc. Residing in South Carolina during the war of secession, he sustained the southern cause in a weekly newspaper, and had his house and library wrecked by federal soldiers. Of his various and voluminous works, some are of high excellence. He died in 1870.

SIMODA (Lowland), a harbor of Japan, at the southern extremity of Cape Idzu, and about 80 m. from Yedo, opened to foreign commerce by the Americans in 1854. In 1854 the town was nearly destroyed by an earthquake, while the harbor was so scoured out that hardly any holding-ground was left for ships on the granite bottom. The pop. was formerly estimated at 80,000, but is now reckoned at about 5000.

SIMON, JULES (JULES FRANÇOIS SIMON SUISSE), b. France, 1814; received his education at the colleges of Lorient and Vannes; and was tutor of philosophy in the lyceum of Caen in 1836. He became a disciple of Cousin, who invited him to Paris, and whose place he supplied at the Sorbonne, in the department of the history of philosophy. He was decorated with the legion of honor in 1845, and became a member of the academy of moral and political sciences in 1863. Simon entered into politics in 1846, and was elected a member of the assembly two years later, as a moderate republican. In 1849 he was elected a member of the council of state, but only held the position for a few months, when he went out of office. He refused to take the oath of allegiance to the empire after the *coup d'état*, and his lectures before the Sorbonne were accordingly suspended. In 1863 he was sent to the corps législatif, and soon became the chief of the republican party. In the cabinet of M. Thiers he held the portfolio of public instruction. In 1875 he was elected a member of the French academy. In 1876 he was director of the *Siècle* newspaper, and leader of the republican left in the national assembly; and in that year, called to form a ministry, he became president of the council, and minister of the interior. M. Simon's last official act was his determined opposition to the amnesty bill for the communists, in July, 1880. He was the author of many works on government and philosophy. He died in 1896.

SIMON, RICHARD, a distinguished orientalist and critical scholar, was born at Dieppe, May 13, 1638. Having completed his studies, he entered the congregation of the oratory in 1659, but soon afterward withdrew. He returned, however, in the latter part of 1662. For a time he delivered lectures on philosophy in the college of Juilly; but his studies eventually turned upon theology, oriental languages, and biblical criticism. At one time he thought of entering the Jesuit order, but he remained in the oratory; and it was while still a member of that congregation that he published his well-known work on the doctrine of the oriental church regarding the eucharist, designed as a supplement to the celebrated *Defense of the Perpetuity of the Faith in the Blessed Eucharist*, by Arnaud and Nicole, but criticising that work very severely. This and other controversies to which his later writings gave rise led to his again withdrawing from the oratory in 1678. In that year he retired to Belleville, as curé; but in 1682 he resigned his parish, and lived in literary retirement, first at Dieppe, and afterward in Paris. His health having given way, he returned once again to his native place, Dieppe, where he died in April, 1712. Few writers of his age played so prominent a part in the world of letters, and especially in its polemics. There is hardly a critical or theological scholar among his contemporaries with whom he did not break a lance—Spanheim, Le Clerc, Du Pin, Jurieu, and Jurieu's great antagonist, Bossuet. The principal work of Simon is his *Histoire Critique du Vieux Testament* (Paris, 1678), in which he anticipates the most important conclusions of all the later rationalistic scholars of Germany, and also their method of investigation. For example, he conceives himself to have disproved the Mosaic authorship of the Pentateuch, and assigns its composition to the scribes of the time of Ezra. Other writings of Simon's are: *Histoire Critique du Texte du Nouveau Testament* (Rotterd. 1689); *Disquisitiones Criticæ de variis Bibliorum Editionibus* (1684); *De l'Inspiration des Livres Sacrés* (Rotterd. 1687); and *L'Histoire Critique des Principaux Commentateurs du Nouveau Testament* (Rotterd. 1693), in which he assails the theology of the fathers, and particularly that of Augustine, as a departure from the simple and less rigid doctrines of the primitive church. Among the fathers, his most esteemed authority was Chrysostom. Bossuet replied to this last work by his *Defense de la Tradition et des Saints Peres*. Simon frequently published under assumed names—as his *Dissertation Critique* on Dupin's *Library of Ecclesiastical Writers* under the name of Jean Reuchlin; a work, *Histoire Critique sur la Créance et des Coutumes des Nations du Levant*, under the anagram of Monis; and a *Histoire de l'Origine et du Progrès des Revenus Ecclésiastiques* under the name of Jerome Acosta. No collected edition of his works has ever appeared; in the natural progress of the science of criticism, the most famous of them have lost most of their prestige, and are displaced by recent, and often second-hand, compilations upon the subjects, which, in the days of Simon, were comparatively new and unexplored; but still

there is much to be learned even from such of his works as have been forgotten by ordinary students.

SIMONIDÉS, a celebrated Greek lyric poet, was born at Iulis, in the island of Ceos, in the year 556 B.C., and educated probably with a view to making music and poetry a profession. He left his native island on the invitation of Hipparchus, who, by means of great rewards, induced him to reside at Athens, where also lived at that time Anacreon and Lasus, the teacher of Pindar, although no intimacy seems to have sprung up between Simonidés and his two rivals. It was probably after the expulsion of Hippias (510 B.C.) that he took up his residence in Thessaly, under the patronage of the Aleuads and Scopads, who appear to have treated him in a very niggardly fashion. Shortly before the invasion of Greece by the Persians, he returned to Athens, and employed his poetic powers in the composition of elegies, epigrams, dirges, etc., in connection with that momentous struggle, taking the prize, in regard to the battle of Marathon, out of the hands of his rival Æschylus. In the year 477 B.C., when Simonidés was 80 years of age, he came off victor for the 56th time in a poetical contest at Athens. Shortly after this he went to reside at the court of Hiero of Syracuse, where he died in 468 B.C., at the age of 90. Simonidés appears to have scandalized his contemporaries by writing for hire; and Pindar, his great rival, accuses him, apparently not without good reason, of excessive avarice. His poetry is imbued with a comparatively high morality. He brought to perfection the elegy and epigram, and excelled in the dithyramb and triumphal ode; he seems also to have completed the Greek alphabet by the addition of the double letters and long vowels, and to have invented the art of artificial memory. The characteristics of his poetry are sweetness, polish combined with simplicity, genuine pathos, and great power of expression, although in originality he is much inferior to his contemporary Pindar. The best edition of his fragments is that of Schneidewin, entitled *Simonidis Cei Carminum Reliquia* (Brunswick, 1835).

This Simonidés must be carefully distinguished from the iambic poet SIMONIDÉS of Amorgos, who flourished about 100 years previous to Simonidés of Ceos.

SIMONTON, JAMES W., b. N. Y., 1823; received a common school education in the city of New York; in 1845 entered the city department of a local newspaper as law reporter. He was afterward Washington correspondent of the *New York Courier and Enquirer*. In 1850 he visited San Francisco; and again in 1859, when he was connected with the *Bulletin* and other newspapers, as part proprietor, and also in an editorial capacity. He was employed on the original editorial staff of the *New York Times*; and for a number of years acted as its Washington correspondent. During the war of the secession he was actively engaged as a war correspondent. In 1867 he was appointed superintendent of the associated press, a position which he held till his death in 1882.

SIMONY, in English law, is the corrupt presentation of any one to an ecclesiastical benefice for gift money or reward, and is so called from its resemblance to the sin of Simon Magus. In the canon law it was considered a heinous crime, and a kind of heresy. As the canonical punishment, however, was not deemed sufficient, a statute was passed in the time of Elizabeth, defining its punishment. A simoniacal presentation was declared to be utterly void, and the person giving or taking the gift or reward forfeited double the value of one year's profit; and the person accepting the benefice was disabled from ever holding the same benefice. Presentation bonds, however, taken by a patron from a presentee to resign the benefice at a future period in favor of some one to be named by the patron, are not illegal provided the nominee is either by blood or marriage an uncle, son, grandson, brother, nephew, or grand-nephew of the patron, and provided the bond is registered for public inspection in the diocese. The result of the statutes is that it is not simony for a layman or spiritual person, not purchasing for himself, to purchase while the church is full, either an advowson or next presentation, however immediate may be the prospect of a vacancy, unless that vacancy is to be occasioned by some agreement or arrangement between the parties. Nor is it simony for a spiritual person to purchase for himself an advowson, although under similar circumstances. It is, however, simony for any person to purchase the next presentation while the church is vacant; and it is simony for a spiritual person to purchase for himself the next presentation, although the church be full.

SIMOOM', or SIMOON (otherwise written Simoun, Semoun, Samoun, Samūn), or Sambuli, a name derived from the Arabic *samma*, signifying hot, poisonous, or generally whatever is disagreeable or dangerous, and applied to the hot suffocating winds which are peculiar to the hot sandy deserts of Africa and western Asia. In Egypt it is called *khamsin* (Ar. fifty) because it generally continues to blow for 50 days, from the end of April to the time of the inundation of the Nile.

Owing to the great power of the sun's rays, the extreme dryness of the air, and the small conducting power of sand causing the accumulation of heat on the surface, the superficial layers of sand in the deserts of Africa and Arabia often become heated to 200° Fahr. to a depth of several inches. The air resting on this hot sand becomes also highly heated, thus giving rise to ascending currents; air consequently flows toward these heated places from all sides, and these different currents meeting, cyclones or whirling masses of air are formed, which are swept onward by the wind prevailing at the time. Since the temperature, originally high, is still further raised by the heated grains

of sand with which the air is loaded, it rapidly increases to a degree almost intolerable. In the shade it was observed by Burckhardt in 1813 to have risen to 122° ; and by the British embassy to Abyssinia in 1841 to 126° . It is to the parching dryness of this wind, its glowing heat (about 200°), and its choking dust, and not to any poisonous qualities it possesses, that its destructive effects on animal life are to be ascribed.

The approach of the simoom is first indicated by a thin haze along the horizon, which rapidly becomes denser and quickly overspreads the whole sky. Fierce gusts of wind follow, accompanied with clouds of red and burning sand, which often present the appearance of huge columns of dust whirling forward; and vast mounds of sand are transported from place to place by the terrible energy of the tempest. By these mounds of sand large caravans are frequently destroyed; and even great armies have been overwhelmed by them, as in the case of Cambyzes, who was overtaken by the simoom on his march through the desert to pillage the temple of Jupiter Ammon, and perished with 50,000 of his troops. The destruction of Sennacherib's army is supposed to have been caused by the simoom. The simoom generally lasts from 6 to 12 hours, but sometimes for a longer period.

The effects of this wind are felt in neighboring regions, where it is known under different names, and it is subject to important modifications by the nature of the earth's surface over which it passes. In Italy it is called the *sirocco*, which blows occasionally over Sicily, s. Italy, and adjoining districts. It is a hot moist wind, receiving its heat from the Sahara and acquiring its moisture in its passage northward over the Mediterranean. It is the plague of Sicily and Naples, and while it lasts a haze obscures the atmosphere, and such is the fatigue which it occasions that the streets of Palermo become quite deserted. The sirocco sometimes extends to the shores of the Black and Caspian seas, and under its blighting touch sheep and cattle die in the steppes beyond the Volga, and vegetation is withered and dried up. It is called the *samiel* in Turkey from its reputed poisonous qualities.—The *solano* of Spain is a s.e. wind, extremely hot, and loaded with fine dust, which prevails at certain seasons in the plains of Mancha and Andalusia, particularly at Seville and Cadiz. It produces giddiness and heats the blood to an unusual degree, causing general uneasiness and irritation; hence the Spanish proverb, "Ask no favor during the solano."—The harmattan (q.v.) of Guinea and Senegambia belongs to the same class of winds.

SIMPLE CONTRACT in English law means any contract which is constituted by word of mouth or by a writing not under seal. See **CONTRACT**.

SIMPLON (Ital. *Sempione*), a famous mountain of Switzerland, one of the Lepontine Alps, in the e. of the canton of Valais, and near the Piedmontese frontier, rises to the height of 11,124 feet. The *Simplon road*, one of the greatest engineering achievements of modern times, leads over a shoulder of the mountain from which it derives its name (the *pass of the Simplon*, 6,592 ft.) from Brieg in Valais to Domo d'Ossolo in the n. of Piedmont. The road was commenced in 1800 under the direction of Napoleon and was completed in 1806. It is from 25 to 30 ft. broad. It is carried across 611 bridges, over numerous galleries cut out of the natural rock, or built of solid masonry, and through great tunnels. A movement was commenced in 1889 for a tunnel to be bored through the mountain underneath the pass, and plans were concluded in 1893.

SIMPSON, a co. in s. Kentucky, bordering on Tennessee; drained by Red river and branches of the Big Barren; traversed by the Louisville and Nashville railroad; 320 sq. m.; pop. '90, 10,878, chiefly of American birth, includ. colored. The surface is level and the soil rich; over 1,000,000 lbs. of tobacco are raised yearly; corn, wheat, wool, butter, and sorghum molasses are the other staples. Co. seat, Franklin.

SIMPSON, a co. in s.e. Miss., bordered by Pearl river on the w., and drained by Strong river; 580 sq.m.; pop. '90, 10,188. The surface is level and partly covered with forests of pine; the soil is sandy. The principal productions are cotton, Indian corn, sweet potatoes, and wool. Cattle, sheep, and swine are raised in large numbers. Co. seat, Westville.

SIMPSON, SIR JAMES YOUNG, was b. at Bathgate, Linlithgowshire, in 1811. He early showed a peculiar talent for medical observation and research: and in the prosecution of his professional studies at the university of Edinburgh, so attracted the notice of his teachers as to inspire all of them with an active interest in his future career. He graduated as doctor in medicine in 1832, on which occasion his inaugural thesis won the highest admiration. Prof. Thomson chose him as his professional assistant, and employed him in the preparation of his course of lectures on general pathology. During the illness of the professor, Mr. Simpson supplied his place in the lecture-room with unusual skill and address. He now began professional practice on his own account; and in 1840 succeeded Prof. Hamilton as professor of midwifery in the university of Edinburgh. This position he has held with yearly enhanced distinction, and by the rigidly scientific while popularly attractive character of his prelections, has contributed greatly to the renown of the Edinburgh school, both at home and abroad. He was indefatigable, amid the distracting cares of an extensive practice, in promoting the scientific perfection of his art; and his two volumes of *Obstetric Memoirs*, edited by Drs. Priestly and Storrer, contain the fruits of much patient and ingenious research. The

discovery by which he will be more particularly remembered, however, is that of the anæsthetic virtues of chloroform. The so-called sulphuric ether had been employed in America by Morton to produce anæsthesia during labor; but to Simpson belongs the credit of having, in 1847, first introduced to the scientific world the far safer, more certain, and now universally adopted agent of chloroform. Another innovation which surgical practice owes to Prof. Simpson is the stoppage of hemorrhage by acupressure. In his own peculiar field of obstetrics, his improvements on the old methods of practice are numerous and valuable; while his contributions to antiquarian research would of themselves create an independent reputation in that field. Besides the *Obstetric Memoirs* already mentioned he published a volume on acupressure; and many papers and notices read before the royal and antiquarian societies of Edinburgh. Among these may be enumerated: *Antiquarian Notices of Leprosy; On the Contagiousness of Cholera; Ancient Roman Medicine Stamps; Was the Roman Army provided with Medical Officers?; On Syphilis in Scotland*, etc. His scientific services were recognized by innumerable medical associations; while his professional distinction secured for him a baronetcy in 1866. He died May 6, 1870. A statue of Simpson was erected in Edinburgh in 1877. See the *Memoir by Duns* (1873).

SIMPSON, JOSIAH, 1815-74; b. New Brunswick, N. J.; graduate of the college of New Jersey, 1833, university of Pennsylvania school of medicine, 1836; assistant-surgeon U. S. army, 1837, surgeon, 1855, brevet col., 1865. He served in the Indian war in Florida as surgeon of the 6th infantry, and through the Mexican war, participating in the triumphant entrance into the city of Mexico. He was post-surgeon at Bedloe's island, 1848-55, was assigned to duty on the Pacific coast, and during the war of the secession in the department of the Tennessee. He was attending surgeon in Baltimore from 1867 until his death.

SIMPSON, MATTHEW, D.D., LL.D., b. Ohio, 1810; began the study of German at the age of 8, and the following year read through the German Bible; graduated at Alleghany college, Meadville, Penn., in 1832; took medical degree in 1833; entered the ministry in the Methodist Episcopal church the same year; professor of the natural sciences at Alleghany college in 1837; president of Indiana Asbury university at Greencastle, Ind., 1839-41; appointed editor of the *Western Christian Advocate* in 1848; elected bishop in 1852; visited the Methodist missions in Syria and the east in 1863; the Mexican missions in 1874, and was a delegate to the European missionary conferences in 1875. He was an intimate personal friend of President Lincoln, took a deep interest in the national cause during the war of the secession, and by his zeal and eloquence contributed much to encourage the government in that fearful crisis. He was one of the most eloquent preachers of his day, and had great influence in the Methodist church. He published *One Hundred Years of Methodism*. He d. 1884.

SIMROCK, KARL, a German poet and scholar, who has done more perhaps than any other man to make his countrymen familiar with their early literature, was b. at Bonn, Aug. 28, 1802. He studied at the university of his native city and afterward at Berlin, and in 1823 entered the Prussian state service. His first work was a translation into modern German of the *Nibelungenlied* (Berl. 1827; 9th ed. Stuttg. and Tüb. 1854), followed by a translation of the songs admitted by Lachmann to be genuine, under the title *Zwanzig Lieder von den Nibelungen* (Bonn, 1840). Soon after the publication of his translation of Hartmann von der Aue's *Armer Heinrich* (Berl. 1830), he was compelled to leave the Prussian service on account of a revolutionary poem which he wrote. Afterward he devoted himself exclusively to literature, and more particularly to the early literature of his own country, which he has modernized in splendid style. In 1850 he was appointed professor of German language and literature at Bonn, a situation which he held till his death, which occurred in July, 1876. His principal works, besides those already mentioned, are: *Quellen des Shakespeare in Novellen, Märchen, und Sagen* ("Sources of Shakespeare in Novels, Tales, and Legends," 3 vols. Berl. 1831), executed in conjunction with Eichermeyer and Henschel, but of which the most important part was Simrock's; *Novellenschatz der Italiener* (Berl. 1832); a translation, with commentary, of the poems of Walther von der Vogelweide (2 vols. Berl. 1833), in conjunction with Wackernagel; and of *Wieland der Schmied, Deutsche Heldensage* (Bonn, 1835), one of the freshest of the German mediæval epics; *Rheinsagen aus dem Munde des Volkes und Deutscher Dichter für Schule, Haus, und Wanderschaft* ("Legends of the Rhine from the Mouth of the People and German poets, for School, Home, and Traveling," 4th ed. Bonn, 1850; latest ed. 1857); a collection of German *Volksbücher* ("People's Books"), comprising national proverbs, songs, and riddles, besides a vast quantity of stories (these, carried on for several years, include many vols.); a translation of Wolfram von Eschenbach's *Parzival und Titurel* (Stuttg. and Tüb. 1842); and *Das Heldenbuch*, partly translations and partly original poems (1843-49), illustrative of the heroic traditions of the Teutonic race. A separate collection of his own poems (*Gedichte*) was published at Leipsic (1844, new ed. 1863). Later productions are a translation of the songs of the Edda (Stuttg. and Tüb. 1851, 3d ed. 1863); a *Handbuch der Deutschen Mythologie* (2 vols. Bonn, 1853-55, 2d. ed. 1864); an *Altdeutsches Lesebuch in Neudeutscher Sprache* (Stuttg. and Tüb. 1854); *Das Deutsche Kinderbuch, Reime, Leiden, etc.* (1856-57); *Der Wartburg-Krieg, Herausgegeben, Geordnet, Übersetzt, und Erläutert* (1858); *Die Nibelungenstrophe und ihr Ursprung; Beitrag*

zur Deutschen Metrik (1858); *Lieder vom Deutschen Vaterlande* (1863); *Deutsche Märchen* (1864); *Gedichte Shakespeare's* (1867).

SIMS, CHARLES N.; b. Ind. in 1835. His early life was spent on a farm, and his education obtained at the common schools; began teaching at the age of 17; graduated at the Indiana Asbury university in 1859; elected the same year principal of Thorn-town academy, the leading Methodist institution in Indiana; chosen president of the Valparaiso (Ind.) college; was appointed pastor of Pearl street church, Richmond, Ind.; was subsequently settled at Wabash, Evansville, Indianapolis, Baltimore, Newark, and Brooklyn; was elected chancellor of the Syracuse university in 1880.

SIMS, GEORGE ROBERT, was born in London, Sept. 2, 1847, and was educated at Hanwell College and at Bonn. He joined the staff of *Fun* in 1874, and the *Weekly Dispatch* the same year. His *Dagonet Ballads* appeared first in the *Referee* to which he contributes under the pseudonym of *Dagonet*. His *Social Kaleidoscope*, *Three Brass Balls*, and *Theatre of Life*, contributed to the *Dispatch*, have been translated into various languages. His first play, *Crutch and Toothpick*, was produced at the Royalty Theatre in 1879. His other plays are *Mother-in-Law* and *Member for Slocum*, 1881; *The Gay City*; *Halfway House*; *The Lights o' London*, one of his most popular pieces; *The Romanay Rye*; *The Merry Duchess*, a comic opera; *In the Ranks* (of which he is part author), was produced at the Adelphi in 1883, and ran 457 consecutive nights; *The Golden Ring*, 1888; and *Jack in the Box* and *The Harbor Lights*, written in collaboration, 1885. He also published two novels, *Rogues and Vagabonds*, and *The Ring o' Bells*.

SIMS, JAMES MARION, b. in S. C., 1813; graduated at South Carolina college in 1832; studied medicine at Charleston and Philadelphia; commenced practice at Montgomery, Ala., in 1836. About 1845 he established a private hospital at the latter city for the cure of vesico-vaginal fistula, in the treatment of which he used silver-wire sutures, publishing an account of the operation in the *American Journal of Medical Sciences*, in 1852. He settled in New York city in 1853, and was instrumental, with others, in establishing the women's hospital, for the treatment of diseases peculiar to women. In 1861 Dr. Sims went to Europe, where he performed several surgical operations by invitation, receiving decorations from the French, Italian, Spanish, Portuguese, and Belgian governments. Dr. Sims published volumes on *Trismus Nascientium: Silver Sutures in Surgery*; *On Intra-uterine Fibroid Tumors*, *Clinical Notes on Uterine Surgery*, and was the author of a standard work on female surgery. He was a member of many learned societies in Europe and America, and was president of the American med. assoc., 1876. D. 1883.

SIMSON, ROBERT, a celebrated Scotch mathematician, was b. at Kirton Hall in Ayrshire, Oct., 1687. He was educated at the university of Glasgow with a view to the clerical profession, and attained great eminence in classical and mathematical knowledge. His taste for mathematics gradually gained the ascendancy, and all other pursuits were abandoned. After a brief residence in London, during which he made the acquaintance of Dr. Halley, Mr. Ditton, and others, he returned to Glasgow, where in 1711 he was appointed professor of mathematics, and for 50 years discharged his professorial duties. Simson's reputation rests chiefly on his "restorations," or, as they might more properly be called, "reconstructions," of the Greek geometers. Some good judges are of opinion that he has corrected many errors in the original text, though his respect for the Greek mathematicians always led him to refer these to the ignorance of editors and the negligence of copyists. His first attempt in this direction was to discover the signification of Euclid's porisms, the only datum being a most obscure and tantalizing description of them by Pappus, the indefiniteness of which had foiled both Fermat and Halley. In this difficult task Simson, however, succeeded; and a similar attempt, attended with similar success, on the "loci plani" and the "sectio determinata" of Apollonius, stamped him as one of the most elegant geometers of modern times. With the thorough insight which he had thus obtained into the nature and processes of the Greek analysis, he set himself to the correction of Euclid's *Elements*. This last work was published in 1758, and has deservedly enjoyed a high character; it has been frequently re-edited and republished as a school-book, especially the edition by Playfair. He died 1768.

SIN is the name given by theologians to the evil of human nature, to the moral defect or perversion which appears an inherent quality of the human will, and in a greater or less degree unavoidably characterizes it in this life. It is something more than evil as affirmed of the external world or of the lower creation. *Evil*, as denoting decay or corruption in nature, is admittedly a mere relative term, for in truth decay is just as normal a process of creation as renovation, and corruption is the condition of restored health and beauty. In a similar manner, evil, such as it exists in the lower animal creation, in the form of *prey* and in the forms of pain, of sickness, and of death—whatever be the special view taken of such phenomena—is never reckoned evil in the sense of *sin*. In order to constitute the special idea of sin, it is always necessary to suppose a moral element in the evil to which it is applied. Whatever form of evil is independent of the human will as its source, origin, or agent is not sin. Theologians, indeed, speak of original sin or the sin of human nature, as distinguished from actual sin, or the particular transgression of the individuals composing mankind. According to a common theological view, men are not only sinners individually, but they are partakers of a sinful nature, with which their will has had nothing to do—with reference to which they have

had no choice of good or evil. The evil has come to them by natural descent from the original parents of the race. But even the most extreme view of original sin preserves a hypothetical relation between every individual will and the primal transgression which it considers to be sin, not merely in those who committed it, but in those who have descended from them. All mankind are supposed to have been in Adam, the first sinner, as their representative, so that "they sinned in him and fell with him in his first transgression." Without such a hypothesis of unity between Adam and his race, so that his will was in some measure the typical or representative will of the race, the notion of original sin could not be maintained. For the relation between sin and will as a moral power, having the choice of good and evil, is a cardinal relation without which it would seem impossible to distinguish sin as a quality from other forms of evil in the world.

SINAI, the mount on which, according to the Pentateuch, God announced to Moses the ten commandments and the other laws by which the Israelites were to be bound. Its exact position is matter of dispute among travelers, but it is to be sought for in the mass of granite and porphyry mountains occupying the greater part of the Arabian peninsula, lying between the gulf of Suez and Akabah, and rising to a height of 8,000 or 9,000 ft. above the sea. This mountain-mass is divisible into three groups: a north-western, reaching, in mount Serbal, an elevation of 6,340 feet; an eastern and central, attaining, in Jebel Katherin, a height of 8,160 feet; and a south-eastern, whose highest peak, Um Shauimer, is the culminating point of the whole Sinaitic range. Serbal, with its five peaks, looks the most magnificent mountain in the peninsula, and is identified with Sinai by the earlier church fathers, Eusebius, Jerome, Cosmas, etc.; but it does not meet the requirements of the Hebrew narrative, and even as early as the time of Justinian, the opinion that Serbal was the Sinai of Moses had been abandoned, and to a ridge of the second or eastern range that honor had been transferred, the northern summit of which is termed Horeb; and the southern, Jebel-Mûsa, or mount of Moses, continues to be regarded by the great majority of scholars as the true Sinai. Its height is variously estimated at from 6,800 to 7,100 ft. above the sea.

At the eastern base of Jebel-Musa, in the ravine of Shouaib, stands in solitary peace the famous monastery of mount Sinai; but in earlier times the mountain had numerous other convents, chapels, and hermitages.

SINAITIC CODEX, a very valuable biblical manuscript, discovered in 1859 by Tischendorf in the convent on mount Sinai, and presented by the monks to the Russian emperor Alexander II. A part of it had been consumed in lighting fires, but there still remained 380 leaves, containing a large part of the Septuagint version of the Old Testament with the Apocrypha, and the whole of the Greek New Testament, with the epistle of Barnabas and a part of the Shepherd of Hermas. The leaves are vellum of exquisite fineness and largest size; the writing is in beautiful and simply formed uncial letters, arranged in 4 columns on each page. There are several decisive marks of great antiquity: 1. The little punctuation which it contains is in the oldest manner. 2. Its peculiarities of spelling and etymology belong to the 4th century. 3. It closely resembles the papyrus manuscripts. 4. The order in which it arranges the books of Scripture is known to have been used at the end of the 3rd century. 5. The division of "larger chapters," universal in manuscripts from the 5th c. downward, is wanting in the Vatican and Sinaitic only. The presence of the "Ammonian sections" and "Eusebian canons" is against an earlier date than the first half of the 4th c.; but as these are written on the margin, and in red ink, they may have been added by a later hand. 6. Its readings correspond with those defended by Origen and with some approved by Eusebius. These criteria and the beauty of the manuscript suggest the possibility that it is one of the 50 copies of the Scriptures which Eusebius, by Constantine's command, had prepared on the choicest skins by skillful writers for churches built to commemorate the emperor's conversion. Whether this be true or not, the manuscript certainly belongs to the 4th c., and probably to the first half of it. Tischendorf pronounces it to be of the same age with the Vatican manuscript. Notwithstanding the beautiful writing of the copyist, he did not always copy correctly. His work also has been subjected to many alterations by various revisers, some contemporaneous with himself, some belonging to the 6th or 7th c., and a few to the 12th. In many places even Tischendorf's skill could scarcely trace the original writing under the alteration. As to disputed readings, it omits the last 12 verses of Mark's gospel; John vii, 53-viii. 11; at *Ephesus*, in Eph. i. 1; and the doxology in Matthew's record of the Lord's prayer: has the reading "church of God," Acts xx. 28; "who was manifest," not "God was manifest," 1 Tim. iii. 16; and *God* instead of *son*, John i. 18. The emperor of Russia celebrated the 1000th anniversary of his empire by publishing a splendid edition of this manuscript, of which only 300 copies were printed, 200 being given away, and the others sold by Tischendorf. Several colleges and public libraries in the United States have obtained copies.

SINALOA, or **CINALOA**, a state in n.w. Mexico, bounded on the n. by Sonora, on the e. by Chihuahua, on the s. by Jalisco, and on the w. by the gulf of Mexico and the Pacific ocean; drained by the Culiacan, Cañas, Fuerte, and Sinaloa rivers, intersected by a branch of the Sierra Madre mountains; area, 33,671 sq. m.; pop. '95, 256,414. The surface is mountainous in the e., with gradually sloping plains in the west. There are a number of gold and silver mines. Capital, Culiacan.

SINAPIS. See MUSTARD.

SINCERE BRETHREN, or **TRUE FRIENDS**, is the name of a semi-religious, semi-scientific Mohammedan order, the beginnings of which are shrouded in obscurity, but which, about 970 A.D., manifested its existence by one of the boldest and most comprehensive literary undertakings—viz., an encyclopædic treatment of philosophy, theology, science, ethics, and metaphysics, in a series of no less than fifty-one treatises. Under the head of **MOHAMMEDAN SECTS**, and more especially under **MOTAZILITES**, mention has been made of that immense religious struggle that arose but a few generations after Mohammed, in the bosom of Islam, bringing forth sect after sect; and which, under whatever name and war-cry, simply denoted the reaction of the thinking minds against the dead-weight of dogmas and formulas, such as the successors of the prophet tried in his name, and often enough in direct contradiction to his explicit dicta, to impose upon the faithful. What the Motazilites had attempted was the reconciliation of scientific speculation, as it had irresistibly grown up at the first contact of the Arabs with Greek literature, with the religious dogma of Islam. This new period of development of Arabic culture, which chiefly characterizes the epoch of the first Abbaside rulers, however, was of no long duration. The representatives of the "orthodox" schools, who would not hear of reconciliation, but insisted all the more uncompromisingly upon the most literal interpretation, dexterously used against them those same weapons of dialectics which their adversaries themselves had first taught them how to wield. Setting to work with proper systems and methods, they soon built up a scholastic edifice of theology, not easy to be attacked without the most direct outspokenness; and from this the new schools, the terror of the caliphate strong upon them, shrank. It was thus that the Motazilites soon disappeared from the arena. But their labors had not been in vain. Silently and by small degrees this new and mysterious union of the Sincere Brethren arose. Though widely spread, their schools, their houses of assembly, their rules, their doctrines—everything remained, for we do not know how long, a profound mystery; and apart from that which they themselves have thought fit to reveal of it, neither ancient nor modern investigation has been able to discover many traces of their inner organization and activity. Not even many of their names have come down to us, though the "treatises" they have left point to a multitude of authors, and to many stages of development. The tone of these treatises is much more free, and their entire tendency more radical than that of any of the books of their predecessors. Yet, the desire not to offend the less advanced in religious matters, and above all to reunite rather than to make the breach wider, is perceptible in their endeavor to use what Koranic quotations and traditions can be pressed into the service of free thought, by often very unnatural processes of allegory and mysticism.

Before speaking of the treatises themselves, we shall briefly summarize what can be gathered as to the mutual relations of the brethren of this secret lodge, and the aims of their association. There is special mention made of the "secret doctrine" which the Brethren should communicate to each other in their houses of assembly at those "stated periods," at which no stranger was to be admitted on any condition. The principal subjects toward which their conservation was to be directed were to be the knowledge of the soul or psychology, the knowledge of the action of the senses and the things perceptible through them, the contemplation and investigation of the mysteries of the sacred books, of the prophetic revelations, and the ideas contained in the divine laws. Their attention was further to be directed toward the four "mathematical" sciences—arithmetic, geometry, astronomy, and (musical) composition. But the chief subject of their investigations should be the knowledge of divine things, which are the end and aim of all study. The most catholic spirit was to prevail among them with regard to the various sciences, systems, or books; since "our own system comprises all, without exception, and includes all science." "The speculations of our school extend simply to all things—the sensual and the intellectual—from the moment of their beginning to their end, according to their outer and inner life—that which is palpable and clear about them, and that which is hidden and secret—the truth, in fact. For the true essence in everything is derived from one primeval origin and general cause, since there is but one world and one supreme mind, to which all the most manifold phenomena, species and kinds, and divisions, are to be traced back." With these words, the encyclopædic tendency of the lodge and their essays is best characterized.

All their knowledge they traced back to four sources—as indeed this number seems to have played a very considerable part in all their divisions—as follows: 1. "The books that are known by the names of the sages and philosophers, in as far as they belong to mathematics and natural history." They do not indicate them further; but it is easy to see from the treatises themselves that they allude to the translations of Greek works bearing the names of Pythagoras, Aristotle, Euclid, Ptolemy, Porphyry, etc. 2. "The revealed writings derived from the prophets," such as the five Books of Moses, the Gospel, the Psalms, the Koran, and other writings of prophets who had received their contents through inspiration by the angels and the "deep mysteries hidden in these books." 3. "Books treating of nature"—i.e., that describe and represent the things now in existence—the celestial circles, the motions of the stars, the transformation of matter, the individual species and kinds of animals, plants, etc. All these things point to abstract

ideas and subtle mysteries of which men in general saw but the outside, ignoring the mysterious art and meaning of the Creator hidden within. But if in this third division of the sources, the power of the mysterious and of spiritualism must needs have become very strong, it seems to have ruled absolute in that most mysterious and obscure of all sources, the fourth—viz., “the divine books, or the books on the divine things, written by the angels from the tablet of fate, upon which all the divine decrees regarding the world and man are inscribed. These contain all that refers to substances, species, kinds, and orders of the different souls; their actions, destinies, metamorphoses, phase after phase, the heavenly conjunctures and periods, etc. For this the Koran was quoted: “And upon the Arap” [the division between heaven and hell] “there will stand men, who will recognize every one by their distinguishing mark. These men, however, are souls who take a higher degree than other men, like the prophets and martyrs, or the elect among the believers and learned, or the angels who appear in human shape.” And that there might be no mistake as to the members of the secret brotherhood being alluded to in this passage, another passage from the same sacred volume is adduced, which reads: These are the men who live in houses which God has permitted to be erected, that His name might be praised therein, in which men proclaim his praise both morning and evening, whom even neither commerce nor trade intercourse keeps from the remembrance of God and the solemn fulfillment of the duty of prayer. “This is the state of our brothers, the highly meritorious, the highly honored.”

The supreme (outward) duty of the brethren was to support one another in case of need. Men are divided into four classes—those who have wealth without knowledge; those who have knowledge without wealth; those who have both; and those who have neither. And this at once points to the necessity of mutual support. Envy and ill-will are seriously reprobated, and here the ethical portions of the Koran and the Sunnah are appealed to. But these fundamental principles are further explained and detailed in the rules almost step by step; and it is shown how each of the four classes named is to make its support of the Brethren more effective. Everything should be directed for the benefit of the soul, not of the body; everything for the future, nothing for this world. Moral qualities are the highest gift of heaven, and the characteristic sign of the angels and the blessed in paradise—a wise and happy way of comforting the poor of the community, who, by moral purity, may lift themselves to the same purity as the best and richest among the Brethren. In order further to prove how the soul is capable of the highest perfection by degrees, the various ages and stages of man are enumerated, and the gradual progression of all faculties is dwelt upon according to the “strength of the soul.” The fourth degree is characterized as the angelic quality of the soul, which is obtained at fifty, and which prepares the way to everlasting life, and to the full separation from matter. To this succeeds the “power of ascension,” whereby the member mounts up into the world of the spiritual heavenly beings, so that he foresees clearly the “things of the end,” such as the resurrection, the last judgment, the dispersion, the meting out of rewards and punishments; how, further, “the path is to be crossed, how he escapes the fire, enters Paradise, and becomes a denizen of the highest realms with the Father of all mercies.” And for this consummation, many passages in the Koran and the Gospel are adduced—no less than the words of Socrates on the day of his taking the hemlock; of Pythagoras at the end of his Golden Epistle, etc.

The encyclopædia of treatises which this secret association has left as the monument of its existence was first compiled at Basrah about 1000 A.D.; but has (save one often reproduced chapter, called “The Contest between Man and Animal”) never been printed. The 51 treatises are divided into four classes: 1, the “mathematical,” in 13 dissertations or treatises; 2, the “physical,” in 17; 3, the “origins” of mental activity, or the thinking soul, in 10; and 4th and last, “the divine law,” in 11 treatises, the last of which contains a general outline of the whole work.

The interest attaching to this production, as the earliest encyclopædia deserving the name, reflecting, as it does, the state of science both of the east and west at the end of the first thousand years after the introduction of Christianity, is so great that we append a sketch of the contents and method.

The first 13 treatises, belonging to what may be called the mathematico-philosophical division, treat of arithmetic, geometry, astronomy, geography, music, followed by psychological and ethical reflections. This part concludes with introductions to philosophy and logic. Throughout, the authors only treat of the theoretical part of their subject, without entering into further details as to their practical side, or teaching them systematically one by one.

From these preliminaries the work proceeds to its second part, the physical division, which comprises the whole cosmos in its special phenomena, and the laws that govern them: heaven and earth, the three natural kingdoms, the mysterious union of body and soul, how the latter pervades the former, and communicates itself to all its parts; the changes of life and death, joy and mourning, the senses, and all that is perceptible through them—all the great questions, in fact, which most vitally engage man's attention in this world of growth and decay. An attempt is made to ascertain how far human understanding can penetrate these dim regions of speculation and metaphysics, and even the languages and their original elements are drawn into the circle of these investigations, and subjected to philosophical scrutiny.

The third division treats of the origins of mental activity. Heterogeneous though some of its elements be, it yet keeps its subject sufficiently in view throughout. The elements of mental activity are investigated first according to Pythagoras, then according to the brethren themselves. Next comes man both as microcosm and macrocosm. The revolutions of the heavenly bodies, love, resurrection, the world to come, motion, cause and effect, dogmas, and customs, are then treated of; each and all contributing their share to the aimed-at outward union between reason and faith.

The fourth division borders very closely on the supranaturalistic and purely speculative. At the same time it touches vital doctrines of Islam, and treats them in an abstract and very free manner. How the knowledge of God is gained; the life of the soul after death; the relation of the brethren toward each other; the essence of the true faith; the divine law; prophecy; and the relation of religion generally to the peculiar phase of it as adopted by the lodge; and a number of similar points, are taken up.

So far, in the most general outlines, those 51 treatises, which, though they be neither strictly systematically arranged nor methodized, nor free from repetitions, and by no means so instructive in detail as the enumeration of the contents would lead to believe, yet belong to the most comprehensive and creditable efforts of the human mind.

A small specimen of the manner and method of these treatises, taken from the chapter (20) on plants may not be unacceptable:

"Know that the plants are only perceptible as the visible, palpable phenomena, but that their artistic working within is secret, invisible, and hidden before the eye. It is what we call the part-souls, what the philosophers call the natural powers, what religion calls angels, or divine hosts commissioned with the calling into being and development of the plants and creatures, with the creation of the stones, etc. The terms differ, but the sense and meaning is identical. Philosophers trace these things to the powers of nature; the religious law to the angels, but not directly to the blessed and exalted God. For the blessed God is too exalted to form a natural body himself—to move and to act bodily, just as kings, generals, and high dignitaries are too high to execute any work themselves, though they are considered their authors, through having ordered and willed them. If, e.g., you hear it said that Alexander built Alexandria, you must not, of course, fancy that he himself bodily did build the city—he ordered it to be built. Thus the works of God's servants are traced back to the exalted God, even as the Koran says: 'It is not you who have killed them, but God.'"

One of the most attractive portions of the work, and the one which alone has been repeatedly edited and translated into many languages (not into English), is the so-called "Contest between Man and Animal," which forms a part of the 21st treatise. In this one place alone man and animals are introduced speaking; in all other portions, rhetoric, ornamented by allegories and metaphors, mostly well chosen and artistically wrought, forms the ordinary style. These dissertations may not have fulfilled their purpose any more than did the whole lodge; but they will be all the better appreciated when that darkest period of Mohammedan history, the 10th c., is taken into consideration. Hypocrisy stood for piety at the courts of the many emirs, low cunning for wisdom, the vilest adulation for fidelity, and oppression for justice. No wonder this manly and scientific protest was not received very favorably by so corrupt a generation. Besides which, the want of strict logical arrangement—a circumstance owing probably to the voluntary suppression of the intermediate portion—and the vagueness in which many of the most important points are treated, made even the few independent and faithful minds fail to appreciate it. The chief cause of the discontent which they excited among the contemporaries lay in their conciliatory tendencies. Theology pure and simple would not hear of philosophy. Religion, the orthodox champion said, was a revelation—divinely given, not to be understood even by human intelligence; philosophy, on the other hand, was a vain thing, treating of human things and other futile subjects. The philosophers, though they dared not be quite so outspoken on theology, felt no less keenly that there was no compromise possible under these circumstances, even if they had not repudiated any notion of being "reconciled."

SINDE, an extensive province of British India, lies in the extreme w. of that territory, and is bounded on the n. by Beloochistan and the Punjab, e. by Rajputana, w. by Beloochistan, and s. by the Arabian sea and the Great Western Runn, an extensive lacustrine inlet which separates Sind from Cutch. It is 380 m. in greatest length, 280 in greatest breadth; contains 47,789 (besides a tributary area) English sq. m.; with a pop. '91, of 2,871,744. The sea-coast, which extends n.w. for 150 m., is very low and flat, with the sole exception of the small portion beyond Karachi (Kurrachi), and is studded here and there with low mud-banks formed by the Indus, or with sand hills, the accumulated drift from the beach; it is overflowed at high-tide to a considerable distance inland, and is hardly visible, according to Burnes, at a league from shore. The province is traversed through its whole length by the Indus (q.v.), which, on approaching the coast, divides and subdivides into a number of channels, forming a delta of 75 m. in length by 130 in breadth. This delta, unlike that of the Ganges, is almost wholly destitute of wood, and the soil consists of a mixture of clay, sand, and vegetable mold, which is speedily baked hard by the heat. Along each bank of the Indus is an alluvial tract of great fertility, extending 2 to 12 m. from the river, and mostly irrigated by artificial canals and water-courses, which, overflowing during the inundations, cover the soil with

a silt so rich as to yield two, and sometimes three crops in a year. The soil, nevertheless, contains in the n. so much saltpeter, and in the s. so much salt, that after the year's crops have been obtained, these substances are extracted for home consumption and export. Between the Indus and its most easterly branch, the Narra, is an alluvial "doab," averaging 75 m. in width, but which, from want of irrigation, has become almost a desert. East of this, on the other side of the Narra, is the *Thur*, a desert of shifting sand. West of the Indus the country is occupied by the desert of Shikarpur or the n., a desert not of sand, but of alluvial clay, the same as that of the delta, which only requires irrigation to render it fertile; and in the s. it is traversed by the Hala mountains. The *Thur*, or eastern desert, has numerous vestiges of former towns, in the shape of heaps of fragments of bricks and pottery. The climate of Sind is remarkably sultry and dry, it being completely beyond the action of the s.w. monsoon. There are generally two harvests per annum; the first, or *rubbi* (spring) harvest, consists of wheat, barley, oil-seeds, millet, durra, opium, hemp, and tobacco; the second, or *kurif* (autumn) harvest, of those crops whose ripening requires much heat, as rice, sugar-cane, cotton, indigo, maize. Tigers, hyenas, wolves, foxes, the onagra, wild boars, antelope and deer are abundant. There is considerable fishing, and dried fish are exported. The population consists of a mixture of Juts (a Hindu race) and Beluchis, with a few Afghans in the n.w.; the greater portion of them are Mohammedans, and the remainder, who profess Hinduism, have fallen far from the strictness of observance which characterizes the most of its followers. Generally, the Sindians are tall and handsome; the Beluchi portion of them warlike and independent; the Juts peaceable, and given to agricultural pursuits. The capital of the province is Kurrachi, with a pop. '91, of 105,199.

From the time (711) that Sind was conquered by the caliph, Abd-ul-Melek, it underwent numerous vicissitudes, forming at times a part of the empire of Delhi, and being latterly (1756) joined to Afghanistan. In 1779 the Beluchis rebelled, deposed their ruler, defeated the Afghans (1786), and raised their leader, the chief of the Talpûr tribe, to supreme power. This chief made large grants of territory to various of his relatives, reserving most of lower Sind for himself and his three brothers; so that there were four "ameers" at Haidarabad, three at Khyerpûr, and one or two at Mirpur. The ameers of Sind always regarded the British government with suspicion, and occasionally troubled those traders who visited their dominions; but they subsequently concluded commercial treaties, which were observed with punctuality. On the outbreak of the Afghan war in 1838, the British government intimated its intention to take temporary possession of Shikarpûr, and forced the ameers of Haidarabad and Mirpur to agree to a treaty which virtually destroyed their independence. Their expression of a natural dislike at the mode in which they had been treated, provoked fresh demands from the Calcutta government, to which the Haidarabad ameers agreed, despite the clamors and threats of their followers, who attacked the British residency on the following day. Sir Charles James Napier, the British envoy, at the head of a considerable military force, then marched against the enemy, totally routed them at Meeanee (Feb. 17, 1843), and by defeating the ameers of Mirpur, at Dubba, near Haidarabad (Mar. 24), completed the subjugation of Sind. The conquered territory was divided into three collectorates—Haidarabad, Karatchi, and Shikarpûr; the ameer of Khyerpûr, by continuing faithful to the British, retaining his dominions. For two years afterward, Napier was actively employed in reducing the marauding tribes of the west, who pillaged the province; and so successful was the "Sheitanka bhai" (devil's brother), as the robber tribes named him, that they were completely rooted out of their fastnesses, and most of them transported to distant regions. The country is reported as rapidly improving under its present administration.

SINDHU (from the Sanskrit *syand*, which in its older form probably was *syandh*, to trickle or flow) is the ancient name of the river Indus and the country along the Indus or Sindh.

SINDIA, the name of a powerful family of Mahratta chiefs and princes, which occupies a conspicuous place in the history of India during the 18th and 19th centuries. The founder of the family was RANOJEE SINDIA, a sudra of the Kûmbi ("cultivator") tribe, who from a menial station in the household of the peishwa, rose to a high rank in the body-guard, and after 1743 received in hereditary fief the half of the extensive province of Malwa. His son, MADHAJEE SINDIA (1750-94), joined the Mahratta confederation, and was present at the battle of Paniput (1761), where he was so desperately injured as to be left for dead, but he speedily recovered, and, on the retirement of the Afghans and their allies, repossessed himself of his hereditary dominions. On the death of Mulhar Rao Holkar (q.v.) he became the chief of the Mahratta princes, and had the command of the peishwa's body-guard; and in 1770, the peishwa and his two powerful feudatories, Sindia and Holkar, aided the emperor of Delhi in expelling the Sikhs from his territories, of which the administration was handed over to Sindia, who was now by far the most powerful of the Mahratta chiefs. The murder of the young peishwa by his uncle, Ragoba, and the consequent expulsion of the murderer from the throne he had seized, brought Sindia for the first time into collision with the British, who had espoused Ragoba's cause; but in the war (1779-82) which followed, fortune distributed her favors

with impartiality, and by the treaty of Salbye (1782) Sindia was recognized as a sovereign prince, and confirmed in all his possessions. In 1784 he captured the stronghold of Gwalior, and in the following year marched on Delhi, to restore his preponderance in the councils of the puppet monarch, and subsequently seized Agra, Allyghur, and nearly the whole of the Doab (q.v.). The manifold advantages of European discipline had struck him forcibly during the war with the British, and, with the aid of an able French officer, he introduced it into his own army. An army of 18,000 regular and 6,000 irregular infantry, 2,000 irregular and 600 Persian horse, with 200 cannon, was accordingly raised, and under the leadership of De Boigne, the officer above noticed, reduced Joudpore, Odeypore, and Jypore, three Rajpūt states, and effectually humbled the pride of Holkar.—DOWLUT RAO SINDIA (1794–1827) continued his grand-uncle's policy, and during the troubles which convulsed Holkar's dominions at the commencement of the 19th c., he ravaged Indore and Poona. He was at this time regarded as the most powerful native chief in India. His army virtually held the Mogul emperor a captive at Delhi, and he made himself supreme at Poona. Naturally enough, he thought that the British should apply to him for aid rather than to any other native chief, but it was against the policy of the British to recognize the authority of an irresponsible chieftain, and governor-general Wellesley, who was then commanding in India, was especially averse to such a course, because he knew that Sindia had called in the aid of the French. Sindia was defeated by Holkar in 1802. Later, having joined Bhonsla, the rajah of Berar, in a raid on the nizām (1803), he brought down upon himself the vengeance of the East India company. The confederated Mahrattas were routed at Assaye and Argaum by sir Arthur Wellesley (afterwards Duke of Wellington), the brother of the governor-general; Sindia's disciplined troops, under the command of French officers, were scattered irretrievably at Patpurgunge (near Delhi) and Laswari by lord Lake, and he only escaped total ruin by acceding to a treaty by which all his possessions in the Doab and along the right bank of the Jumna were ceded to the British. Gwalior was, however, restored in 1805, and from this time became the capital of Sindia's dominions. Sindia had been taught by his reverses a useful lesson, and he declined to join Holkar, the peishwa, and Bhonsla, in their attack (1817) on the British, and thus escaped the swift destruction which was visited upon his turbulent neighbors. During the reign of BHAGERUT RAO SINDIA, a minor, the Gwalior dominions were in such a state of anarchy, that the British were compelled to insist on certain guarantees for the preservation of tranquillity; and on these being rejected, a war followed, and the Mahrattas were routed at Maharajpūr (Dec. 29, 1843) by lord Gough, and at Puniaur by maj.-gen. Grey on the same day. Gwalior fell into the hands of the British, Jan. 4, 1844, and Sindia submitted to the conditions demanded of him, besides maintaining a contingent force of sepoys at Gwalior. In 1853 he was declared of age by the East India company, and 1858 he took the field at the head of his own army against the Gwalior contingent, which had joined in the great sepoy mutiny. But the most of his troops deserted him during the battle (June 1), and he narrowly escaped by fleeing to Agra. Sindia was subsequently reinstated by sir Hugh Rose, and received from the British government numerous testimonials of his grateful respect. He was made a knight grand cross of the order of the bath.

SINECURE (Lat. *sine cura*, without care) in common language, an office which has revenue without employment. In the canon law, a sinecure is an ecclesiastical benefice, such as a chaplainry, canonry, or chantry, to which no spiritual function is attached, except reading prayers and singing, and where residence is not required. The strictest kind of sinecure is where the benefice is a donative, and is conferred by the patron expressly without cure of souls, the cure either not existing or being committed to a vicar.

SIN'EW. See TENDON.

SIN-GAN-FOO, a city of China, capital of the province of Shen-See, on the right bank of an affluent of the Hoang-ho. It was formerly the capital of the empire; pop. about 150,000. It is large, inclosed by walls, and is the chief military depot for the northern province of China. A Syrian inscription has been found here recording the introduction of Christianity by the Nestorians in the 4th century.

SINGAPORE, one of the Straits settlements (q.v.), belonging to Great Britain, consists of an island lying off the s. extremity of the peninsula of Malacca, in lat. about 1° 17' n., long. 103° 51' e., and having a city of the same name on its s. side. The island is 27 m. long, and from 11 to 15 broad; area, 206 sq. miles. It is separated from the mainland by a narrow but deep strait, varying from a mile to a few furlongs in width. The surface is generally low and undulating, the greatest elevation (Bukit Timah, or the Hill of Tin) being only 520 feet. According to Malay accounts, a colony was planted on the site of the present town by tribes who are inferred to have been Javanese, from the circumstance that the name Singapura, which they gave to their settlement, is most probably of Sanskrit origin (lion-town); the Javanese being the only people in these seas who have become fairly Hinduized. Be that as it may, in 1818 it was found by sir Stamford Raffles to be an island covered with primeval forests, sheltering in its creeks and rivers only a few miserable fishermen and pirates. It seems to have been unclaimed by any power until 1811, when the sultan of Jahore formally annexed it to his territories. The commanding position of Singapore, in the very center of the highway leading from British India to China, led sir Stamford Raffles to mark it out as the site of the first free port in the Malayan seas; and in 1819 the British flag was hoisted on the new settlement;

although it was not till 1824 that Mr. Crawford concluded a satisfactory treaty with the sultan of Jahore, whereby the island of Singapore, and all the islands within 10 m. of its shore, were given up in full sovereignty to the East India company, on condition of a considerable yearly payment. Since then the prosperity of Singapore has been almost without a parallel. Its position as an entrepôt for the trade of the Malayan archipelago, the Eastern Peninsula and China, and the wise policy that placed the commerce of the new port on an entirely unfettered footing, rapidly established a flourishing trade. In 1823 the imports amounted to £1,200,000; the exports to £920,000. In the year ending April 30, 1865, the value of the imports was \$33,000,000; the exports the same, being fully double the amounts in 1854-55. In 1889 the imports were \$156,199,061; the exports, \$133,219,281.

Notwithstanding the opening-up of more direct communications with Europe of many of the markets in China, Cochinchina, and Siam, formerly largely supplied by traders from Singapore, the commerce has increased, and in 1895 the value of imports was \$157,968,829, and of exports \$135,126,348. The local trade and the exports to the British colonies at the same time showed an increase. The splendid harbor of S. is well sheltered and of easy access, and lying as it does at the converging points of the great trade routes of the East, is visited by a large number of vessels. A savings-bank was established at S. in 1871, and is now managed by a secretary immediately under the colonial treasurer. Under the new postal contract, letters can be delivered in S. twenty-eight days after their leaving England. Singapore is a free port; all commodities are entirely free from duties. The Chinese control the trade in spirits and opium.

The chief articles of export to Europe and North America are gambier, tin, sago, tapioca, black and white pepper, tortoise-shell, sugar, buffalo hides, india-rubber, gum, dye-stuffs, tobacco, nutmegs, gutta-percha, camphor, coffee, sapan-wood, and rattans. Of these, only gambier, sago, and nutmegs are produced on the island to any important extent, all the other articles being imported, chiefly by natives, from other quarters. From Europe large imports are received of cotton manufactures, metals, hardware, earthenware, arms and ammunition, opium, rice, tea, coffee, cigars and tin. Large fleets of prahus are wafted by the southerly monsoon toward this great center of trade, laden with the numerous products of the Indian archipelago, to return again laden with the manufactures of Europe. In 1876, 2149 vessels, of 1,454,689 tons, entered the port; and 2182, of 1,428,992 tons, cleared. In 1880, 2120 vessels, of 1,693,096 tons, entered at Singapore; 1728 steamers, of 1,359,913 tons, cleared—besides 4657 coasting craft entered and 4694 cleared. In 1893, 4435 ships, of 3,519,063 tons, entered and cleared the port. In 1880 the local revenue of Singapore was \$278,475, the expenditure being \$288,685. In 1895 Singapore paid \$2,290,642 towards the revenue of the colony. Education is being steadily advanced in Singapore and a zealous desire on the part of the Eurasians to learn English is now observable.

By act of 1895, the silver Mexican dollar, weighing 417.74 grains, and .9027 fine, was made the standard coin. The Chinese pecul, of 133½ lbs. avoirdupois, which is divided into 100 catties, is the standard of weight. The population of Singapore is perhaps the most heterogeneous in the world, comprising at least 16 nationalities, speaking different tongues. The Malay, however, soft and easily acquired, is the recognized medium of communication between all classes. The population, which is increasing, amounted in 1871 to 97,111, of whom 61,752 were in the town of Singapore and its environs, 31,235 in the country, and 4124 on board of vessels. According to the census report for 1891, the population of the island was 184,554, of whom 5254 were Europeans and Americans. The most numerous elements in the population were: Chinese, 121,908, Malays, 35,992, and immigrants from India, 16,035. Of the aboriginal inhabitants of the island not a trace remains; but similar tribes are still to be found in small numbers in several parts of the peninsula. Of the native population, the Chinese are the most useful part; they form almost the only body of trustworthy native merchants, in the proper sense of the word, and are freely trusted to large amounts by European importers; and it may be doubted whether, as a commercial body, they are, on the whole, more deficient in morality than many European communities. The laws are those of Great Britain, with some modifications; the court is that of a recorder. The governor of the Straits settlements (lieut.-col. sir C. H. B. Mitchell, G.C.M.G., 1895), is assisted by an executive and legislative council. Singapore is the seat of government for the Straits settlements (q. v.), which, on April 1, 1867, were transferred from the control of the Indian government to that of the secretary of state for the colonies.

The city of Singapore, which had, in 1891, 160,000 inhabitants, is situated at the mouth of a small river, on the Singapore side of the island. It is the seat of government for the whole of the Straits settlements. Its appearance is of a mixed oriental and European character; the streets are generally wide, and kept in good order. The European quarter contains several hotels, an esplanade, a Gothic cathedral, and mission buildings. Fort Canning stands on a hill on the left bank of the Singapore river, and on another hill is the governor's palace. Among the other important features of the city are the Raffles museum, with a library, the botanical gardens, and the numerous Buddhist temples of the Chinese. There is an efficient police, and the sanitary arrangements of the town are good. The municipal council consists of public officers and ratepayers.

Singapore possesses two fine harbors; one opposite the town, which, although little more than an open roadstead, is a safe and convenient anchorage, where ships load and discharge by means of lighters; the other is about 3 m. w. of the town, and is land-

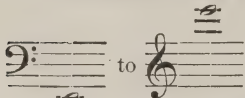
locked, and capable of admitting the largest vessels. Along its shores, extensive wharves have been erected by steam companies and individual merchants; and it is probable that when communication by railway with the town is established, the old harbor will be little used. There are several fortifications commanding the harbor and roads, but the increasing commercial and political importance of the place calls for a still stronger naval and military station. Singapore being within 80 m. of the equator, has little or no variety of seasons; the climate, although hot, is healthy; the temperature ranges from 71° to 92°; rain falls more or less on 200 days of the year, and the extent of the fall is about 87 inches. The soil of Singapore is not fertile, although the climate is such as to cover it with a rich and beautiful vegetation. The nutmeg was at one time successfully cultivated, but most of the trees having unaccountably died, this has been abandoned, and husbandry is now confined to the cultivation of the cocoa-nut, the pepper-vine, and gambir plant, and to the raising of sugar-cane and vegetables for local consumption. The curse of Singapore is the tiger. Turtle are abundant on the shores, and form the cheapest animal food in the bazars. — See Thomson's *Journal of the Indian Archipelago*; J. Crawford's *Dictionary of the Indian Islands and Adjacent Countries*; J. Cameron's *Our Tropical Possessions in Malayan India*.

SINGHALESE LANGUAGE. See CEYLON.

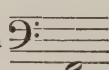
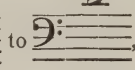
SINGHARA NUT. See TRAPA.



SINGING, the art of producing music from the human voice, generally, though not necessarily, combined with speech. The mechanism of the vocal organs, as applicable to singing, has by some physiologists been likened to a reed, by others to a stringed instrument; in point of fact, the human voice is produced by an apparatus far beyond either in complexity of structure.

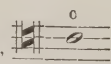
The extreme limits of the voice in respect of pitch may be considered to be from

; but the compass of any individual voice is limited to a portion

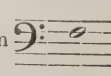
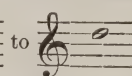
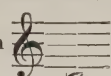
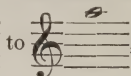
of that range, and voices are classified according to their pitch. Generally speaking, male voices lie an octave below female. The former are divided into *bass* and *tenor*,

the compass of ordinary bass voices being considered to be from  to .

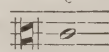
and of tenor from  to . For tenor music, the tenor or C clef is,

generally used, , which has the advantage of having the principal tones within

the staff. When the treble clef is used, the music is written an octave above its true pitch. Female voices are either *contralto* (otherwise called *alto*) or *soprano*, the former

extending from  to , the latter from  to , or some

times higher. Contralto music may be noted either on the treble clef, or on the alto clef, which latter is but the tenor clef placed on the third instead of the fourth line of

the staff . These are the principal divisions of voices; but there are also

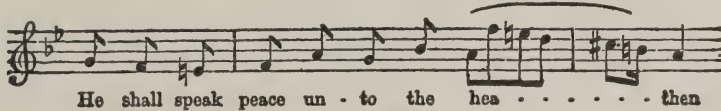
further subdivisions. Intermediate between bass and tenor is another male voice, called *baryton*; and intermediate between contralto and soprano, another female voice, called *mezzo soprano*. The ordinary compass of a voice is about twelve notes, but two octaves are not uncommon, and some voices have reached three. Madame Catalani is said to have possessed a voice of three and a half octaves compass.

The notes produced in singing are of two kinds, according as they proceed from the chest voice (*voce di petto*), or head voice (*voce di testa*). The chest notes, or lower register, proceed naturally and readily from the ordinary mechanism of the voice; the upper register, head voice, or falsetto, is produced by a more or less forced contraction of the cavity from which the voice proceeds, imparting to the notes a fife-like character, gentle and weak in the male voice, but often clear and sonorous in the female. It is only in the higher notes of the voice that the falsetto is used, and some notes on the borders of the two registers may be given in either. Where the two registers meet, the tones are apt to be hard and uncertain, or weak; but a cultivated singer will blend the head and chest voice at the point of junction, so as to make the break imperceptible. The notes

of the bass voice are given entirely from the chest. In the tenor, the three or four upper notes belong mostly to head voice. The contralto tones are mostly chest voice, and the upper tones of the soprano are head voice. The alto, when sung, as it often is in England, by male voices, is principally falsetto. See VOICE, SOLFEGGIO.

In singing, the head should be held erect, and the chest well expanded, to allow free play to the lungs and free emission of the voice from the throat. The tongue should be kept still, slightly pressing on the lower teeth. Proper regulation of the breath, and proper articulation of the words, are also matters of essential moment.

One particular requires to be mentioned, in which the notation of songs differs from that of instrumental music. In the latter, two or more quavers or semiquavers may be grouped together by a common line; in singing, this can only be done when the whole group are to be sung to one syllable, and notes belonging to different syllables are always written separately. When notes without hooks, or notes that are not grouped, belong to one syllable, they are bound together by a *slur* placed over them, e.g.:



SINGLE TAX. The form of taxation proposed by Mr. Henry George (q.v.), who would abolish all taxes that fall on industry and economy, and substitute a single tax upon land equal to its rental value exclusive of improvements. This would practically abolish the private ownership of land by making it unprofitable, and substitute ownership by the state. According to the advocates of the theory, the application of the plan would simply take for the state those differential gains from the land which are the result of natural forces, not of the efforts of the producer. The "unearned increment" as represented by the rental value of the land would thus accrue to the benefit of the community as a whole, not to the benefit of private owners as at present. But the actual rental value includes something besides this "unearned increment," namely, profits from improvements made or paid for, by existing owners. The difficulty of separating the economic rent from these profits complicates the question of compensation to present owners and affords one of the grounds of objection to the plan. In *Progress and Poverty* Henry George holds that under the system of private ownership of land, all advantages from improved methods of production are monopolized by the landowner. By abolishing their peculiar monopoly he thinks he would thus be rendering justice to the other agents of production.

SING SING, a village in Westchester co., N. Y.; on the Hudson River and the New York Central and Hudson River railroad; 30 miles n. of New York. It is beautifully located on ground rising 300 feet above the water, at the widest part of the river, and commands a magnificent view of the river, palisades, highlands, and many points of historical interest. It contains the Holbrook and Mount Pleasant military academies, St. John's school, public and school libraries, national and savings banks, electric lights and street railroads, a soldiers' monument, and a section of the Croton aqueduct, which crosses Kill brook by a stone arch with a span of 88 feet and a height above the water of 70 feet, and a second arched bridge beneath the first for highway travel. The industries of the village include the manufacture of steam engines, gas and water pipe, cotton gins, carriages, sleighs, porous plasters, pills, lime, etc. Sing Sing contains many pretty dwellings of New York business men, and is a popular place of summer residence. It is also the seat of one of the state prisons, on account of which many attempts have been made to have the name of the residence portion changed. Pop. '90, 9,352.

SINIGAGLIA, or **SINIGALLIA** (anc. *Sena-Gallia*), a city and sea-port on the e. coast of Italy, in the province of Ancona, and 16 m. w.n.w. of the city of that name, at the mouth of the Misa. Sinigaglia is celebrated for its annual fair, which lasts from July 22 to Aug. 8, and which was formerly one of the most famous in Europe and still has considerable activity. Sinigaglia was founded by the Senonian Gauls, and colonized by the Romans 285 B.C. Pop. '81, 9062; commune, 11,361.

SINISTER, in heraldry, the left-hand side of a shield. As shields are supposed to be carried in front of the person, the sinister side is that which covers the bearer's left side, and therefore lies to the spectator's right. See POINTS OF ESCUTCHEON.

SINKING FUND. The name given to a fund set apart usually by regular accretions for the ultimate purpose of discharging the debt of a government or corporation.

SINOPÉ (Turk. *Sinub*), a t. of Asiatic Turkey, vilayet of Castamouni on the southern side of a little promontory running eastward into the Black sea (185 m. n.e. of Angora). Sinopé, which is defended by some half-ruined fortifications, possesses a dock-yard and naval arsenal; exports timber, dried fruits, tobacco, fish, and skins, and had a population, '89, of 7162 souls. The bay of Sinopé, which affords the finest anchorage for ships along the whole northern coast of Asiatic Turkey, was the scene of a bloody naval engagement, or rather massacre, Nov. 30, 1853, when a Turkish squadron of 13 ships was suddenly attacked and destroyed by the Russian fleet.—Of the ancient city of Sinopé, which was founded by a colony of Milesian Greeks, and, for 200 years

after the Peloponnesian war, was almost the mistress of the Euxine, numerous ruins still exist, "friezes, hundreds of Corinthian columns, capitals, sculptures, inscriptions, and even statues, built up into the walls of its picturesque Byzantine fortifications." Sinope was the birthplace of Diogenes the cynic.

SIN' OPLE, in heraldry (q.v.), the same as vert.

SINTER, the name given by German mineralogists to those rocks which are precipitated in a crystalline form from mineral waters. They are of recent date, belonging in fact to the strata at present in course of formation. Sinter is of various forms, kidney-shaped, knotted, tuberos, botryoidal, tubular, stalactitic, shrub-like, or pronged, and is occasionally distinguished by its chief component, as calcareous sinter, flint or quartz sinter, iron sinter, etc. Calcareous sinter, which is a variety of carbonate of lime, composed of concentric plane parallel layers, appears under various forms; it is deposited with extraordinary rapidity by many springs, a peculiarity frequently made use of to obtain the incrustation of objects with a coating of this substance. Quartz sinter is mostly found in intermittent hot springs, as in the Geysers (q.v.) of Iceland. Iron sinter occurs in old mines, and in coal-beds, where it is formed from iron pyrites through the agency of the atmosphere. The tubular conglomeration of grains of sand half-melted by lightning (*blitz*) is also known as *blitz-sinter*, or *fulgurite* (q.v.).

SINUS (Lat. a bend or hollow) has two significations in anatomy, and one in surgery. The cells or cavities contained in certain bones—as the frontal, ethmoid, sphenoid, and superior maxillary—receive this designation. The frontal sinuses are two irregular cavities extending upward and outward, from their openings on each side of the nasal spine, between the inner and outer layers of the skull, and separated from one another by a thin bony septum. They give rise to the prominences above the root of the nose called the nasal eminences. They are not developed till after puberty, and vary considerably in size, being usually larger in men than in women and young persons, in consequence of the greater prominence of the superciliary ridges in the former. When very much developed they give a receding appearance to the forehead. They are larger in Europeans than in negroes, and are very imperfectly developed in the Australians, whose peculiar want of vocal resonance is apparently due to this deficiency. They communicate on each side with the upper part of the nostril by a funnel-shaped opening, which transmits a prolongation of mucus membrane to line their interior. These cells are much more highly developed in certain mammals and birds than in man. Prof. Owen observes that "they extend backward over the top of the skull in the ruminant and some other quadrupeds, and penetrate the cores of the horns in oxen, sheep, and a few antelopes. The most remarkable development of air-cells in the mammalian class is presented by the elephant; the intellectual physiognomy of this huge quadruped being caused, as in the owl, not by the actual capacity of the brain-case, but by the enormous extent of the pneumatic cellular structure between the outer and inner plates of the skull." The sphenoidal sinuses are two large irregular cavities, formed, after the period of childhood, in the body of the sphenoid bone. They communicate with the upper part of the nose, from which they receive a layer of mucus membrane. Like the frontal sinuses, they serve to lessen the weight of the skull, and to add to the resonance of the voice. The ethmoid sinuses or cells lie in the lateral masses of the ethmoid bone. They open into the cavities of the nose. Their main use is to diminish the weight of the forehead of the skull. The superior maxillary sinus commonly known as the *antrum of Highmore* (the anatomist who first accurately described it) is the largest of the facial sinuses. Its uses are the same as those of the others, and, like them, it communicates with the nasal cavities.

The *sinuses of the dura mater* are quite distinct from the above described bony sinuses; they are irregular channels for the transmission of venous blood, and are formed in the following way: the dura mater consists of two layers—an outer, belonging to the skull; and an inner, belonging to the brain. They can be easily separated in infancy, but in the adult they are blended together for the greater part of their extent. In some places, however, as beneath the sagittal suture (formed by the two parietal bones at the top of the head, and running from before backward), they are separated on either side of the mesial line, the outer layer being continued beneath the bone, and in contact with it; while the inner one dips inward, and meeting with the corresponding layer of the opposite side, forms a triangular canal or sinus, which is strengthened at the sides and angles by interlacing bands of fibrous tissue. The sinus whose formation we have thus described is called the superior longitudinal sinus, and the other sinuses are formed in the same way. They are all lodged in the intervals between the great divisions of the brain, and they are so constructed "that their shape cannot easily be altered by any external pressure; consequently, the flow of blood through them cannot be impeded by the pulsations or pressure of the brain, in the varying positions of the body. The tense, unyielding character of their walls, moreover, does not admit of either collapse or distension; hence, they must be equally full at all times, and must exert a uniform pressure on the brain."—Humphrey *On the Human Skeleton*, p. 200.

In surgery the term *sinus* is nearly equivalent to *fistula* (q.v.).

SION, a small t. of Switzerland, capital of the canton of Valais, in a picturesque situation on the right bank of the Rhone, 17 m. e. of St. Maurice to the n. of the Rhone.

It is defended by walls, towers, and a ditch, and contains a large cathedral, a handsome Gothic town-house, a Jesuits' convent, and an ancient prison. On the n. of the town is a lofty rock, divided into two peaks by a deeply-cut ravine. On the highest peak is the ruined castle of Tourbillon, built in 1294; on the other, the castle of Valeria, now used as a seminary. An excellent wine, called Malvoisie, is made here. Sion is called *Civitas Sedunorum* in a still existing inscription in honor of Augustus, to be seen in the cathedral; in the middle ages it was named *Sedunum*. Pop. '90, 5513.

SIOUT, also *Es Siout* and *Osiât*, the capital of upper Egypt, stands near the w. bank of the Nile, in lat. 27° 12' n. It has several fine mosques, bazars almost as well furnished as those of the capital, some good baths, and one or two well-built houses. Siout manufactures great quantities of the best pipe-bowls. It is a railway terminus. It is the residence of the governor of upper Egypt; the resort of the caravans from Darfur that come by the way of the great oasis, and until recently was the principal seat of the Egyptian slave trade. Pop. '82, 31,575. Siout is built on the site of the ancient Lycopolis, but few remains of the Græco-Egyptian city are extant. From the neighboring heights of the Libyan mountains, which contain numerous rock-sepulchers, the view over the valley of the Nile is, in the opinion of Lepsius, the finest in Egypt.

SIoux, a co. in n.w. Iowa, bounded by Sioux river on the w., which separates it from S. Dakota, crossed by the Chicago, St. Paul, Minneapolis, and Omaha railroad, and drained by Rock river and Willow creek; 768 sq. m.; pop. '90, 18,370. The surface is slightly undulating; the soil is fertile. Co. seat, Orange City.

SIoux, a co. in n.w. Nebraska; 2046 sq. m.; pop. '90, 2452. Co. seat, Harrison.

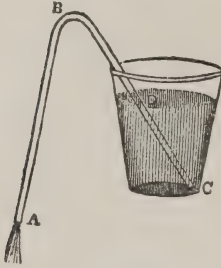
SIoux, or **DAKOTAS**, are a race or collection of Indians, inhabiting the Dakotas, Nebraska, Wyoming, etc., comprising the Santees, Yanktons, Minikonges, Brulés, Sissetons, Unkpapas, Ogalallahs, Aldewakantons, Wahpetons, and Teton. When found by the French in 1640, near the head-waters of the Mississippi, they were called the Nadowessieux, whence the name Sioux. In 1689 Nicolas Perrot took possession of their country for the French. In wars with the French they were driven down the Mississippi and into the plains of the Missouri. Their territory extended from the Mississippi to the Black Hills, and from Devil's lake to the mouth of the Big Sioux. The American board sent missionaries to the Wahpetons near fort Snelling in 1835, and the Methodists in 1836, who established schools and printed books in their language. In 1837, Sept. 29, the Sioux ceded to the United States all their lands e. of the Mississippi for \$300,000, and in 1851, for \$3,000,000, the lands from Otter Tail lake through lake Traverse to the junction of the Big Sioux and the Missouri, comprising 35,000,000 acres, except a reservation of 200 by 140 miles. The government's neglect to perform its treaties led to hostilities, but the Sioux were defeated by Gen. Harney at Little Blue Water, Sept. 3, 1855, and a treaty of peace was concluded. Subsequently, their annuities being withheld and frauds practiced upon them, they rose and killed nearly 1000 settlers. They were conquered by Gen. Sibley and Gen. Sully; 1000 were captured and 39 hung. Gold having been discovered in the Black Hills in 1868, the United States wished to purchase the tract, and induce the Indians to migrate to the Indian territory. In 1875 Sitting Bull, Red Cloud, and Spotted Tail visited Washington, but refused to sign a treaty; nor were efforts in that direction successful till 1889, when part of their reservation was ceded to the United States. They number about 25,000. See RIGGS, STEPHEN.

SIoux CITY, city and co. seat of Woodbury co., Ia.; on the Missouri river, and the Chicago, Milwaukee, and St. Paul, the Chicago, St. Paul, Minneapolis, and Omaha, the Illinois Central, the Sioux City and Northern, the Sioux City and Pacific, the Sioux City, O'Neill, and Western, and the Union Pacific railroads; 100 miles n. of Omaha. It contains a high school, Morningside college, city normal school, college of medicine, college of music, kindergarten, several German Lutheran and Roman Catholic parochial schools, Samaritan and St. Joseph's hospitals, Women's home for the friendless, boys' and girls' home, babies' home, Y. M. C. A., W. C. T. U., and public library. There are Riverside, Leeds Island, and several smaller parks, U. S. government building, two bridges across the river, electric lights, electric street railroads, water works supplied from driven wells, over 40 churches, and many banks and periodicals. The U. S. census for 1890 reported for Sioux city 196 manufacturing establishments, employing \$5,222,626 capital and 3,008 persons, paying \$1,871,425 for wages and \$10,295,190 for materials, and having a combined output valued at \$14,119,843. The most important industry is slaughtering and meat-packing; the city also has the general shops of several large railroads, and one of the largest linseed oil plants in the country. Pop. '90, 37,806.

SIoux FALLS, city and co. seat of Minnehaha co., S. D.; on the Sioux river, and the Burlington, Cedar Rapids and Northern, the Chicago, Milwaukee, and St. Paul, the Chicago, St. Paul, Minneapolis, and Omaha, the Great Northern, and the Illinois Central railroads; 90 miles n. of Sioux City, Ia. It is the seat of Sioux Falls university (Bapt.), All Saints' school (P. E.), and a Lutheran normal school; of the Protestant Episcopal bishopric of South Dakota, and the Roman Catholic bishopric of Sioux Falls; and of the State school for deaf mutes and the State penitentiary. It has a public and several other libraries, valuable jasper quarries, excellent water-power, and manufactories of woolen and linen goods, etc. Pop. '90, 10,177.

SIPHON is a tube bent so that the two legs are either parallel, or incline at an acute

angle, and is employed to desirable to move. The



Siphon.

draw off liquids from vessels which it is not convenient or principle of this simple and efficient instrument is easy of explanation: let ABC (fig.) be a siphon, with one leg, BC, partially immersed in liquid, and suppose the whole siphon filled with the same liquid; then at A we have the pressure of the atmosphere acting upward into the tube in opposition to the pressure of the liquid in the leg BA; at C we have the pressure of the atmosphere (transmitted through the liquid), and the pressure of the liquid in the vessel outside (which balances an equal height of liquid inside) the tube, acting upward into the tube in opposition to the pressure downward of the liquid in the leg BC. The effective pressures inward at A and C are, respectively, the atmospheric pressure less by the pressure of the liquid in BA, and the atmospheric pressure less by the pressure of the liquid in BD; and as the latter of these two is the greater, it overcomes the other, forces the liquid in the tube out at A, and that in the vessel into the tube at C, the process continuing till the liquid falls

to the level of C (when air is admitted), or of A (when the two pressures become equal). It is evident from the above explanation that when A is on or above the level of D, the surface of the fluid, there can be no flow through the tube; also, that it is quite immaterial whether the longer or the shorter leg be immersed, if only A be below the level of D. If the bend of the siphon be 33 ft. for water, or 30 in. for mercury, above D, the pressure at C, which produces the action of the siphon, becomes the weight of the atmosphere, diminished by an equal weight of a column of fluid, in which case the resulting pressure is zero, and there is no flow through the tube. The flow increases in rapidity and force as the difference of level between D and A increases, and as the difference of level between D and B diminishes. Many siphons have a suction-pump permanently attached to the end of the outer leg for the purpose of exhausting the air inside. Another variety is the *Wurtemberg siphon*, which has two equal legs, the extremities of which are bent upward, so that when the siphon is once filled with fluid, it remains full, and is always ready for use.

SIPHONOSTOMA. See FISH-LOUSE.

SIPHONOSTOMATA, a large group of gasteropodous mollusks, of the order *pectini branchiata*, having the mantle prolonged into a siphon, by which the water enters the gill-chamber. The shell is spiral, the aperture notched or produced into a canal in front, often much produced. To this group belong the families *cypræidæ* (cowries, etc.), *volutidæ*, *buccinidæ* (whelks, etc.), *muricidæ*, and *strombidæ*. They are almost all carnivorous, and move about with considerable activity.

SIPUNCULUS, a genus of *echinodermata*, giving its name to a family, *sipunculaceæ*, and to an order, *sipunculidæ*. The *sipunculidæ*, although ranked among the *radiata*, and having the essential characters of that division of the animal kingdom, resemble the *annelida* in form, general appearance, motions, and habits, as well as in their softer covering, which is leathery and not calcareous, and in the absence of calcareous spines. The *sipunculaceæ* have a retractile proboscis, around the extremity of which is a circle of tentacula, and at the base of it the anus. In the genus *sipunculus* the proboscis is long and cylindrical, with a circle of tentacula near its extremity. *S. Bernhardus* is common on many parts of the British coast, living at the bottom of the sea, at a depth of from 10 to 30 fathoms, and occupying as a habitation the shell of some univalve mollusk, for the protection of its soft wormlike body. It secures the entrance of the shell by a plaster-work of sand, leaving only a hole wide enough for the protrusion of its long flexible proboscis. Other species, instead of sheltering themselves in shells, burrow in the sand. Among these is the **EDIBLE SIPUNCULUS** (*S. edulis*), much esteemed by the Chinese. See *illus.*, **WORMS, ETC.**, vol. XV.

SIR (Fr. *sieur* and *sire*, contracted from *seigneur*; from Lat. *senior*, elder), a term originally corresponding to *dominus* in Latin, and which has come, when appended to the Christian name and surname, to be the distinctive mark of knighthood. It was at one time the practice to use the same title in addressing the clergy, a familiar instance being sir Hugh Evans in the *Merry Wives of Windsor*. To so great an extent did this usage obtain, that a "sir John" came to be a common sobriquet for a priest. "Sir" was here a translation of *dominus*, the term used for a bachelor of arts, originally in contradistinction from the *magister*, or master of arts, but eventually extended to the clergy without distinction. Used along with the Christian name and surname, "sir" is now applied exclusively to knights and baronets. Standing alone, it is a common complimentary mode of address used without much consideration of rank or social status. "Sire" is another form of the same monosyllable, which has been adopted from France as a mode of addressing royalty.

SIR-DA'RIA. See JAXARTES.

SIREN, a genus of perennibranchiate batrachia, of eel-like form, but having two small weak limbs on the fore part of the body. Each foot has four toes. There is no vestige of a hinder pair of feet, nor of a pelvis. The vertebræ are numerous, and each of the vertebræ of the body carries a pair of short ribs. The vertebræ of the tail are compressed, and gradually diminish in size to its tip. The head is flattened, the mouth not deeply cleft, the muzzle blunt, the eyes very small, the ears concealed. The teeth are small; the lower jaw is furnished with them all round; there are none on the upper jaw, but two rows on each side of the palate. On each side of the neck are three gills, each consisting of a short fleshy stalk, supporting a beautiful fringe-like tuft, and water passes from the mouth to the gills through openings as in fishes. But the siren has also lungs, which are long bags, one on each side, beginning behind the heart, and extending almost the whole length of the abdomen. The blood disks are remarkable for their large size, exceeding even those of the proteus. The sirens inhabit the swamps of the Carolinas and other southern parts of North America. They live chiefly in the mud, but sometimes are to be seen swimming in the water, and even make excursions on moist ground. They feed on worms and insects. *S. lacertina* grows to the length of about 3 feet. Its color is blackish. The tail is compressed. The other species are smaller.

SIRÈNE, an instrument for the production of musical sounds in such a manner as to enable us to discover their ultimate nature. In the simplest form of sirène a vane consisting of four equal plates, attached to a delicately supported axle, is so fixed in a metal tube as to close it almost completely (with the help of stops), when either pair of plates is perpendicular to the axis of the tube. When air is forced from a bellows through a pipe, it gives the vane a rotation, and thus produces a current which is interrupted four times in each revolution. In other words, four times in each revolution the air escapes freely, giving rise to a sound. While the vane revolves slowly, the ear distinguishes these successive puffs; but when the revolutions are more numerous than about five per second, the successive puffs cannot be distinguished, and the recurrent sounds are merged into a uniform note, whose pitch rises (i.e., it becomes more and more shrill) the faster the vane revolves. Such an instrument works well when driven by water instead of air. What it shows is, that musical sounds consist of the repetition, at equal very small intervals of time, of some definite noise. By turning the vane by means of a train of wheels, so as to give it a definite rate of rotation, the number of such repetitions per second, necessary for the production of a given musical note, may be measured.

But the sirène of Cagniard de la Tour is much more valuable for such a purpose, as it counts for itself the number of repetitions per second. In principle, it is identical with the simpler instrument just described; but the details of its construction are different. It consists essentially of two circular disks, the upper of which is free to revolve so as almost to touch the lower. In each a series of holes is cut, arranged at equal distances in a circle about its axis. Through the holes in the lower (fixed) plate, streams of air are admitted from a bellows, and pass through the corresponding holes in the upper (movable) plate, when the pairs of holes are superposed; but are checked when the upper plate is turned a little, readmitted when the plate turns a little further, and so on. The holes are pierced *obliquely* through the upper plate, so that the issuing stream makes it turn about its axis. The sounds given by this instrument are exceedingly pure (see SOUND), like those of the flute or tuning-fork. The axis of the upper plate carries an endless screw, which turns a light train of wheels (with dials) resembling that of a gas meter, so that when, by proper adjustment of the pressure in the bellows, the instrument gives steadily some definite note, we may observe the number of turns in any number of minutes by watch. The number of puffs is obviously to be found from this by multiplying by the number of holes in the plate, since during one turn any hole in the upper plate has been opposite each of those in the lower plate in succession. Thus we find the number of puffs per second necessary to the formation of any given musical note.

More complex forms, such as Helmholtz's double sirène, have been devised for more recondite branches of the science. See SOUND; also illus., SOUND, fig. 15.

SIRE'NIA, an order of aquatic mammals, allied to the cetaceans, and including the manatees (q.v.) and the dugongs (q.v.).

SIRENS (Gr. *seirênes*, the "entanglers," probably from *seira*, "a cord" or "string") figure in Greek mythology as young maidens, who sat on the shores of a certain island or promontory near the south-western coast of Italy, and sang with bewitching sweetness songs that allured the passing sailor to draw near, but only to meet with death. Homer speaks of them in the plural, but does not specify their number; later writers mention two and three by name, and assigned them various genealogies. Their tenure of life was dependent on the successful exercise of their charms. If any seamen could resist the enticements of their magic music, they were doomed, but Ulysses or the Argonauts alone succeeded in doing so. It is related by Homer, in the *Odyssey*, that when the former in the course of his wanderings approached their perilous home, he, by the advice of the sorceress Circe, stuffed the ears of his companions with wax, and lashed

himself to a mast, until he had sailed out of hearing of the fatal songs. Others say that it was the Argonauts who got safely past, owing to the superior enchantment of Orpheus's singing, whereupon the sirens threw themselves into the sea, and were transformed into rocks. The Latin poets give them wings, and in works of art they are often represented as birds with the faces of virgins, and are provided with musical instruments. There is obviously a close resemblance between the mermaid (q.v.) of northern mythology, and these Græco-Mediterranean sirens. The Loreley of the Rhine is only a river-siren, though a more exquisite enchantress than ever Greek fancy conceived.

SIRINAGUR. See **SERINAGUR.**

SIR-I-PUL, a t. of Afghan Turkistan, 45 m. s.w. from Balkh, in lat. 36° 21' n., and long. 66° 28' e., on a river which loses itself without reaching the Jihoon.

SIRIUS, otherwise called *canicula*, or the *dog-star*, is a star of the first magnitude, the brightest in the heavens, and is situated in the constellation of *canis major*, or the "great dog." It is about 123 billions of miles distant from the earth. See **STARS**. It has long been known to possess a "proper motion" (i.e., an independent progressive motion), which was for a time believed to be in a straight line, but has now been shown to consist of an undulatory progressive motion on each side of a middle line. This motion was investigated by Prof. Peters of the Pulkowa observatory, Russia, on the supposition that its anomalous character was produced by the attraction of some unseen neighbor, and his calculations being completed and verified (on this supposition) by Mr. Safford of Washington, the distance of Sirius from the center of gravity of both was determined to be 1495 millions of miles. In Jan., 1862, Mr. Alvan Clark of New York, chancing to observe Sirius through a powerful telescope, detected a minute star (which had never before been observed) situated at an angular distance of 7" from Sirius representing about 4,300 millions of miles, and it is generally believed that this is the disturber in question. By photometric measurement it has been shown, that, supposing the intensity of the sun's light for unit of surface to equal that of Sirius, it would require 400 suns at the distance of Sirius to send us the light which that star does; and our sun at the distance of Sirius would appear less than a star of the sixth magnitude, and be invisible to the naked eye. The Egyptians called this star Sothis, and at one time its "heliacal rising" (q.v.) was a sure forerunner of the rising of the Nile; while among the Romans it was considered as a star of evil omen, whose appearance above the horizon coincided with (or even caused) the unhealthy and oppressive heats of summer. Hence the origin of the various superstitions regarding the dog days (q.v.), many of which are still current. —The term "dog star" was also applied to Procyon, a bright star in *canis minor*, whose heliacal rising differs only by a few days from that of Sirius.

SIROC'CO. See **SIMOOM.**

SISCO, a common name for several species of small fishes of the genus *argyrosomus*, inhabiting the northern lakes of the United States. They resemble the herrings in form; lower jaw longest, short intermaxillary bones. They rarely attain a pound in weight. *A. clupeiformis* is found in all the great lakes, generally inhabiting shoaler waters, while *A. hoyi* is found only in the deep waters of lake Michigan, from 30 to 70 fathoms beneath the surface. When salted and smoked they are much esteemed.

SISCOWET, *SISKAWITZ*, *Salmo siscowet*, a species of lake trout. It is about five times as long as the head, exclusive of the tail fin; and there is about the same proportion between the length and breadth. The color varies with the feeding ground, and is brighter during the breeding season, as is commonly the case with the family. This species is characteristic of lake Superior, but is found in the deep water of the other great lakes. It is said to have been first scientifically noticed by Prof. L. Agassiz, in 1850. Its average weight is about four and a half pounds, maximum eight pounds. The color of the flesh resembles that of the great lake trout, as well as its texture. It is very much valued, particularly for salting and packing. It spawns in August and September, in deep water, never ascending the rivers.

SISKIN. See **ABERDEVINE.**

SISKIYOU, a co. in n. California, adjoining Oregon; drained by the Klamath river and its branches; 5680 sq.m.; pop. '90, 12,163, chiefly of American birth, with Chinese. Before 1874 the county included part of what is now Modoc county. The surface is mountainous, mount Shasta, the highest peak, being 14,442 ft. high. There are some fertile valleys, where wheat, oats, butter, wool, hay, and cattle are staples. Co. seat, Yreka.

SISMONDI, JEAN CHARLES LEONARD DE, a distinguished historian of Italian descent, was born at Geneva on May 9, 1773. He received his education as a boy at the "college" or high school of his native town. At the due age he was removed to the *auditoire*, or university. Before he had completed his education, the pecuniary reverses of his father made it necessary for Sismondi to do something for his own maintenance, for which purpose he entered the counting house of the eminent firm of Eynard & Co. of

Lyons. Hateful as mercantile pursuits seem to have been to him, he applied himself to his drudgery with all diligence. He became a thoroughly good clerk, and in after life he acknowledged that the practical training had been of incalculable benefit to him. The French revolution sent Sismondi back to Geneva, but the storm following, he took refuge in England, along with his family. Home-sickness soon sent them back to Geneva, but the continuance of political trouble made it impossible to remain there long. In 1795 they bought a small farm near Pescia, in Tuscany, where their narrow circumstances rendered it necessary for Sismondi almost literally to put his hand to the plow. He had now, however, leisure for literature. In 1798 he began to collect materials for his *History of the Italian Republics*. In 1803 appeared a work on political economy, *De la Richesse Commerciale*, in which he writes like a decided follower of Adam Smith, though at a later period, in his *Nouveaux Principes d'Economie Politique* (1819), he abandoned the wiser views of his youth. In consequence, a professorship in this science was in the same year offered to him in the university of Wilna, which he declined. It was in history, however, that his literary forte lay. The 16 vols. of his *Histoire des Républiques Italiennes*, published between 1807 and 1818, placed him in the first rank among contemporary historians, and brought him praise from the most distinguished men in France and Germany. The events of the hundred days occasioned one of the most memorable passages in the life of Sismondi—his interview with Napoleon. In 1813 appeared his *Littérature du Midi de l'Europe* ("Literature of the South of Europe," Eng. by Roscoe, frequently reprinted). In 1819 he began his best and greatest work, the *Histoire des Français*, with which he was occupied until his death. On April 19, of the same year he married Miss Allen, an English lady, whom he had previously met in Italy. This marriage was followed by many happy years, during which Sismondi resided at Geneva, making frequent visits to Pescia and England. His latter days were, however, darkened by the troubles of his native city, in whose politics he took a keen interest. He died June 25, 1842. Sismondi has contributed more to historical literature than any other writer of his time, and the labor which he bestowed on his works has never been surpassed. "Nine times," he says, "have I traversed Italy, and I have visited every place which has been the scene of any great historical event." For twenty years he worked habitually eight hours a day. Both as a worker and as a thinker he was thoroughly conscientious. His mind was to the last open to truth; neither fettered by prejudice nor blinded by self-conceit. At the same time, no one has surpassed him in tenacity of purpose, nor in energy in following it out. His feelings on religious questions were especially intense. Having on one occasion heard a sermon in an English church on eternal punishment, he vowed never again to enter another church holding the same creed; and "never to contribute to spread what the English call their reformation; for by its side Romanism is a religion of mercy and peace." His private character was singularly amiable and benevolent. His whole career is a noble one, full of interest and instruction.—See *Quarterly Review*, Sept. 1843; *Vie et Travaux de Sismondi* (Paris, 1845); see also his correspondence with Mlle. de St. Aulaire (Paris, 1863); and his *Lettres Inédites à Madame d'Albany* (1864).

SISTERHOODS, in the Roman Catholic church, began in the 4th century. Slowly at first, but with great and rapid increase in the 17th and 18th centuries, they became the right arms of charity, and at last organized bulwarks for the preservation and propagation of the church faith by assuming the education of children, and girls especially, of the poor. French authorities classify them into contemplative and active: the former devoted to religious routines, partly of study, of worship of saints, and of such penances and mortifications of the flesh as the barbarous ideas of the times required; the latter, though less beneficent than they have since become, were to some extent devoted to useful works in narrow spheres. The organizations called active, occupied with good works rather than devotions, served in the hospitals which were established in the middle ages by the church. Every convent had its hospital for the poor, and the superior devotedness and good influence of women as nurses led to the establishment of orders of women who devoted themselves to the work. Convent life during many centuries was a fashionable refuge for maidens and matrons, especially in France, whose misfortunes had deprived life of its common hopes, and to whom religious seclusion offered peace, quiet, the satisfaction of doing good, the hope of future reward, and, to a few, headship and authority. The sisterhood devoted to outside beneficence were but a small part of these vast convent establishments, but have continued to multiply, while the purely devotional orders are becoming extinct.

Down to 1840 the church had conferred its sanction upon 164 distinct organizations of sisters. Previous to A.D. 1500 there were 34 orders founded on the contemplative system and 17 active; 1500–1600, 10 contemplative to 13 active; 1600–1700, 54 active and 12 contemplative; and 1700–1840, 40 active and not one other. Since 1840 a considerable number of the most efficient of these active orders have originated, outside of the church or its convents, which have received sanction and ordination after their usefulness had been well established. The following chronological list is only of those institutions of sisters whose mission was in part of beneficence outside of convent walls:

ORDERS OF ACTIVE SISTERS IN THE ROMAN CATHOLIC CHURCH DOWN TO 1840.

Date.	Name of Order.	Date.	Name of Order.
580	Notre Dame de St. Paul.	1633	Miséricorde.
626	Converties.	1636	Miramiones.
1097	Hospitalières Hôtel Dieu.	1636	Filles de St. Généviève.
1207	Canonesses— <i>secular</i> .	1638	Notre Dame de Charité.
1212	Sœurs de Saint Esprit.	1638	St. Joseph Sisters.
1215	Madeleine.	1643	Hospitalières de la Flèche.
1220	St. Elizabeth of Hungary.	1645	Sœurs de St. Agnes.
1265	Merci (third order).	1650	Sœurs de St. Joseph au Puy.
1288	Elizabeth of Hungary.	1650	St. Joseph Sisters.
1290	Sœurs Grises.	1652	Filles de St. Charles Borromeo.
1328	Hospitalières Canonesses.	1652	Providence de Dieu.
1328	"	1650	Sœurs de St. Alexis de Limoges.
1443	Filles de Marthe.	1659	Villeneuve Hospitalière.
1477	Consort à Milan.	1660	Sœurs de St. Thomas de Villeneuve.
1534	Sœurs Angeliques.	1661	Union Crétienne.
1537	Ursulines de Paris.	1662	Enfance de Jésus.
1537	" Parme.	1666	Dames de St. Maur.
1538	Collectines.	1667	Sœurs de la Foi.
1538	Capucines.	1673	Hospitalières de St. Joseph.
1547	Jesuitesses.	1678	Enfant Jésus— <i>educational</i> .
1556	St. Bridget.	1679	Sœurs de Charité d'Evron.
1559	Augustines de St. Catherine— <i>educational</i> .	1683	Dames de la Providence.
1584	Démesses.	1684	Dames de St. Cyr— <i>educational</i> .
1589	Bare-footed Augustines.	1685	Hospitalière de Dijon.
1590	Purification.	1685	Sœurs de l'Ecole Crétienne.
1598	Ursulines of Rome.	1686	Good Shepherd.
1600	Visitation.	1688	Bethlémites.
1601	Congrégation de Notre Dame.	1688	Filles du Bon Pasteur.
1602	Ursulines of Aries.	1698	Sœurs de Charité de Nevers.
1605	" Toulouse.	1699	Sœurs de St. Paul.
1606	" Bordeaux.	1702	Tiers Ordre du Carmel.
1606	" Burgundy.	1703	Filles de la Sainte Trinité.
1610	Compagnie de Notre Dame.	1716	Filles de la Sagesse.
1610	Penitents.	1730	Filles du Bon Sauveur.
1610	Ursulines de Lyons.	1734	Sœurs de Charité de Jauville.
1613	Sœurs de la Doctrine Crétienne.	1739	Hospitalière d'Evremont.
1614	Ursulines de Tulle.	1762	Sœurs de la Providence.
1616	Augustines de la Recollection.	1766	Hospitalière St. Roch Limoges.
1618	Madolennettes.	1775	Sœurs du Saint Sacrement de Maçon.
1619	Ursulines de Dijon.	1805	Ursuline de Chavauges.
1621	Hospitalières of Loches.	1806	Sœurs de St. André.
1621	Retreat.	1807	Dames de St. Sophie.
1622	Ursulines of Foligno.	1807	Sœurs de l'Enfance de Jésus et de Marie.
1623	Presentation—Ursulines.	1807	Sœurs de Sainte Crétienne.
1624	Notre Dame de Charité.	1814	Dames du Sacre Cœur.
1624	Notre Dame de Refuge.	1820	Sœurs de St. Joseph, Lyons.
1625	Congrégation de la Croix.	1820	Sœurs de la Providence, Maine.
1629	St. Vincent de Paul Sisters.	1820	Sœurs de la Providence de St. André.
1630	Congrégation de la Miséricorde de Jésus.	1824	Dames de Lorette.
1630	Filles de la Providence et de l'Union Crétienne.	1827	Notre Dame de Bon Secours.
1630	Presentation.	1840	Petites Sœurs des Pauvre.

Persons who have not been through the great hospitals of Europe are unaware of the extent of the work of the sisterhoods. When these hospitals were under the government of the church instead of the state, the mothers-superior of the sisters of one order or another were supreme managers of the work and attendance on the patients. The Ursulines have been longest and most widely known in this labor; established in 1537 by Angela de Brescia, both in Milan and in Paris, with the intention that the sisters should not be recluses, but live in their own homes and go out to do the work which the superior of the order should point out. But it was found that greater efficiency could be attained by associating in a community, and the order merged into the convent system. The founder inserted in the rules of the order that its members should be free to act according to the need of the age, and that the sisters should be free to so far live among others as to enable them openly to seek out the afflicted and to perform any act of charity which they could find to do. They now labor in nearly every civilized country in the world, but are subject to the government of the Roman Catholic church. The Sisters of St. Vincent de Paul, less ancient, equally renowned for their devotion and self-abnegation, were organized by a priest of that name and formed their first community in Paris in 1633, and systematized the education of their number to specific labors according to individual fitness. No external signs of devotees were required, and no vows for more than a year. Though organized by a priest, he seemed to guard it against absorption into church control, and abolished the system of requiring applicants to hospitals to confess before being admitted. Throughout Europe, but far more in France than elsewhere, the ladies perfected the means of utilizing the latent benevolence around them, and educated to the work poor girls desirous of devoting themselves to it. Christ's hospital, in London, was committed to their charge in 1643, and in 1652 they went in numbers from Paris to Warsaw during a plague in that city. All the operations of housekeeping, as well as nurs-

ing and light surgical work, were practiced, in order to perfect their members for every service that could be rendered. In 1789 the order had 426 houses in France. They were seriously crippled and interfered with by the turbulent reforms of the French revolution, which, in suppressing all monastic and conventual establishments and confiscating their property, deprived the sisters of their communal homes, notwithstanding their communities were excepted in the decrees of suppression. In 1801 Napoleon gave a new civil legal character to the order by a decree of the minister of the interior; since which time there has been no check to their extension. Like members of similar orders they are now known simply as Sisters of Charity. The order was introduced into the United States in 1808 at Emmettsburg, Md., by Mrs. Seton, of New York, but seems to have been more devotional than active in its work there. In 1814 a branch opened in Philadelphia to conduct an orphan asylum for children orphaned by the yellow-fever pestilence. They may be found in nearly all our cities. North France seems a perennial spring of similar organizations, nearly always originating with poor girls or women whose zeal and will to do good attract a cluster of similar spirits to form new organizations with some feature peculiar to the needs around them. The Sisters of the Good Saviour, founded by two poor girls at Caen, Normandy, in 1720, while similar in their first work to the preceding, took also a special interest in the insane, and in 1817-18 were charged by the French government with the care of insane women and afterward of men. They have become specialists in that charity, and in the care and education of the deaf and dumb in France. In 1874 the Caen house of 300 sisters had charge of 1000 insane persons. In Montreal and Quebec a similar work has been committed to the Sisters of Providence. The most remarkable recent organization of Sisters of Charity is the one called "The Little Sisters of the Poor," originated at St. Servan, a village on the n. coast of Brittany, under the guidance of a village priest, Le Pailleur, Marie Augustine, and a few poorest-of-the-poor sewing-girls and old women. They formed practically a band of beggars, but so thorough in their self-abnegation to help others, so quiet and unobtrusively bent on doing good, that by 1842 they had attracted to their work the full sympathy of the community around them, and a wide fame. They were then organized into an order under the church, with the above name, and their organization in many cities has become the almoner of the people always willing to give of their abundance rather than of their time when sure that the gift will reach the needy. Their specialty is rather among the aged and suffering poor than in hospital service, and they make their homes in the midst of the want and squalor which they alleviate. They now have branch houses in the United States, but it is an alien soil to the women who have been so useful in France, and a field less needing them.

An Anglican order of the Sisters of Mercy was founded at Devonport, England, 1845, by Miss Lydia Sellon, who adopted a garb for the vocation; but the sisters were bound by no vows except of obedience to the superior while connected with the organization. It was composed of three classes of workers: those living in community and devoted singly to its active and laborious work; those residing with the community to give minor assistance while living a calm religious life; and married or single women in society who can be relied on to give time to the work. It has a number of branches in England. The sisterhood of St. John the Baptist is another association under the English church, modeled upon the conventual system rather than upon the more practical working models of the modern French Sisters of Charity. There are quite a number of similar societies in England, all established within the past 30 years, of which the Sisters of the Poor, established in 1851, is one of the most active. In the United States the voluntary associations of benevolent ladies, acting by committees, in single church congregations, or by non-sectarian associations, have an expansion and efficiency that enable them to do the same kind of work as the Sisters of Charity, except in hospitals and asylums, where the thorough organization, the devotional zeal, and the trained experience of the professional sisters, is pre-eminently valuable. Dr. Muhlenberg established the Sisters of the Holy Communion in New York in 1845, who have no established garb, are required to be between 25 and 40 years old, to enter with the consent of parents or guardians, to labor on probation one year, and who may leave at their own pleasure. This organization has done a quiet but very efficient work in the charge of St. Luke's hospital, New York. There were, 1885, 13 Prot. Epis. sisterhoods in the U. S., having under their control many institutions of charity, reformatories, schools, etc. They have proved useful auxiliaries to the clergy in their work among the poor and degraded. See *illus.*, PRIESTS, MONKS, ETC., vol. XII.

SISTER DORA. See PATTISON, DOROTHY.

SISTERS OF CHARITY. See BROTHERS AND SISTERS OF CHARITY.

SISTOVA, an important commercial t. of the principality of Bulgaria, on the s. bank of the Danube, about 35 m. up the river from Rustchuk. It has several mosques, an ancient and strong castle, where the "peace of Sistova" between Austria and Turkey was concluded in 1791. There is some trade. Pop. (1888), 12,482.

SISUPĀLA is in Hindu legend the sovereign of Cheti, a country situated in central India, who was the enemy of Krishn'a (q.v.), and ultimately was slain by him. The history of this enmity, and the death of Sisupāla, are the subject of the *Sis'upālabādhā* of Māgha. See SANSKRIT LITERATURE.

SISYPHUS, a personage of Greek mythology, whom later accounts make to be the father of Odysseus. He is said to have been founder and king of Ephyræ—afterward Corinth—and both he and his whole house were notorious for their wickedness. He is, however, best known for the punishment which he suffered in the lower world, either for treachery toward the gods, or for his wholesale robbery of travelers, whom, at the same time, he murdered with a huge block of stone. He was condemned to roll an immense boulder from the bottom to the summit of a hill, which, whenever it reached the top, rolled down again, and the task of Sisyphus had to be begun anew.

SITÂ is, in Hindu mythology, the daughter of Janaka, a king of Mithilâ, and the wife of Râma. See **VISHN'U**. The word means literally "furrow," as she was not born in the usual sense of this word, but arose from a furrow when her father was plowing the ground, whence she is also called *Pārthivî* (from *pr'thivî*, the earth). Her history is related in the **RÂMÂYAN'A** (q. v.).

SITKA, or **NEW ARCHANGEL**, the capital and port of entry of Alaska, is a small place of '90, 1188 inhabitants, on the w. coast of the island of Sitka or Baranov, the largest island in the group known as George III's Archipelago; in lat. 57° 3' n., long. 135° 18' west. Sitka was the residence of the governor of Russian America, and had a magnetic observatory. Here the chief establishments of the Russian-American company, incorporated 1799, for fishing and hunting fur-bearing animals, were situated. The company employed 50 ships, and about 850 men, but their privileges expired in 1863. S. has an industrial and a public school.

SITOPHOBIA, or **SITOMANIA**. The repugnance to or refusal of food may range from mere impairment or loss of appetite, or hysterical antipathy to particular viands, to total and prolonged abstinence, as a symptom of delusion or delirium. In the insane, food has been consistently refused for years. During this time the system was, of course (see **FAST**), sustained by compulsory alimentation. The causes of such a course are generally local disease in the organs of digestion, creating disgust and loathing toward food, and associating suffering with the process of nourishment; the fear of death, or the desire for death. The motives assigned for such feelings or resolution vary, of course, as the morbid condition may affect the stomach or the brain; and, according to the mental state predominating, suicide may be courted, or poisoning, drugging, or pollution of aliment may be dreaded. The throat or bowels may be imagined to be hermetically sealed; God or Satan may have imposed abstinence; the body is dead, inanimate, or belongs to another. Absurd as such principles of action may be, they prove inexpugnable to persuasion, or to the pangs of hunger and exhaustion, and require a special course of treatment. The determination may be exorcised by medicine; it may be overcome by commands, threats, bribes; it may be evaded by giving eggs, cocoa-nuts, milk from the cow, and other substances, into which mercury, arsenic, etc., cannot well be introduced; or it may be defeated by placing food in the stomach through the instrumentality of the stomach-pump. There have been epidemics of maniacal abstinence.—Chipley, *American Journal of Insanity*, July, 1859; Browne, *Report Crichton Institution*, 1854.

SITTA. See **NUT-HATCH**.

S'IVA (a Sanskrit word, literally meaning happy, auspicious) is the name of the third god of the Hindu Trimūrti (q. v.) or triad, in which he represents the principle of destruction. The name S'iva, as that of a deity, is unknown in the Vedic hymns, but established as such in the epic poems, *Purânas* and *Tantras*. The worshipers of S'iva (see **S'AIVAS**) assign to him the first place in the Trimūrti, and to them he is not only the chief deity, but the deity which comprises in itself all other deities. Thus, in the *S'iva-Purâna* (see **PURÂN'A**), he is addressed as Brahma, Vishn'u, Indra, Varun'a, as the sun and the moon, as earth, fire, water, wind, etc.; but even in the *Purânas* relating to Vishn'u, his power is exalted in praise, and he is addressed with the utmost awe. The symbol of S'iva is the *Linga* (q. v.), emblematic of creation, which follows destruction. From each of his numerous attributes or characteristics he derives a name or epithet. He has five heads (hence his name *Panchânana*, etc., the five-faced); three eyes (hence his name *Trinetra*, etc., the three-eyed), one of which is on his forehead, and indicates his power of contemplation; and in the middle of his forehead he wears a crescent. His hair is clotted together, and brought over the head so as to project like a horn from the forehead. On his head he carries the Ganges, whose course he intercepted by his hair, when this river descended from heaven, so as to enable the earth to bear its fall (hence his name *Gangâdhara*, etc., the Ganges-bearer). Round his neck he carries a garland of human skulls; and his throat is dark blue, from the poison which he swallowed when it emerged from the ocean, churned by the gods for the attainment of the beverage of immortality, and threatened to destroy the world. In his hands he holds the trident, a club or pole, armed at the upper end with transverse pieces, representing the breastbone and ribs adjoining, and surmounted by a skull and one or two human heads. His weapons are the *Khinkhira*, which is not described, a bow called *Ajakava*, or *Ajagava*, a thunderbolt, and an axe. As the destroyer of the world he is also called *Kâla* (time or death), and represented as of black color. One of his representations is also half-male

and half-female, emblematic of the indissoluble unity of the creative principle (hence his name *Ardhanārīś'a*, the half-female-lord). He is clothed in a deer-skin; or he also holds a deer in one of his hands; or he sits on a tiger-skin, or is clothed in it. When riding his vehicle is the bull Nandi, whom he also carries as an emblem in his banner. He resides on the wonderful mount Kailāsa, the northern peak of the Himalaya, where he also rules over the north-east quarter. His principal wife is *Durgā* or *Umā* (q.v.); his sons are GANES'A and KĀRTTIKEYA (q.v.). One of his principal attendants is *Tan'du*, who is one of the original teachers of the arts of dancing and mimicry, whence S'iva is the patron of the dancers, and is called *Nat'es'wara* (lord of the dancers). Besides Tan'du, a host of other attendants and companions, together with demons and other beings surrounding him, are named by the Purāṇas.

Amongst the principal achievements of this god is his conflict with the god Brahma, who was originally possessed of five heads, but lost one through exciting the anger of S'iva; for the fifth head of Brahma, once disrespectfully addressing S'iva, and even challenging his power, S'iva immediately cut off the offending member with the nail of his left thumb. A similar penalty he inflicted on *Daksha*, his father-in-law, who once performed a great sacrifice, but neither invited his daughter Satī nor her husband S'iva. S'iva, nevertheless, appeared at the sacrifice; but when Satī, offended at the reception she met with, threw herself into the sacrificial flames, S'iva cut off the head of Daksha; and Daksha would have remained headless had not the gods interfered in his favor with S'iva, who, out of compassion, replaced his head by that of a ram. Besides these feats he killed several demons—*Ruru*, *Andhaka*, *Triṇpura*; and he also reduced to ashes *Kāma* (the god of love), who, at the instigation of the gods, undertook to excite the desire of S'iva to procreate a son, but was indiscreet enough to choose for this purpose a time when S'iva was engaged in fierce austerities (see KĀMA). S'iva is especially worshipped under the symbol of the linga; but there are periods at which homage is paid to him also under other forms corresponding with the description given above. Hindu mythology knows, properly speaking, no incarnations of S'iva like those of Vishn'u; in some writings, however, some of his forms, especially that called Bhairava, and that called Virabhadra, are considered to be his sons or incarnations. S'iva, like Vishn'u (q.v.), has 1000 names by which he is addressed; some derived from his exterior attributes have been mentioned before; among the rest the principal are *Is'a* or *Is'wara* (lord); *Mahes'a* or *Mahes'wara* (the great lord); *S'ankara* (the conferrer of happiness); *Rudra* (the terrible); or *Mahārūdra* (the very terrible); and *Mahādeva* (the great god). For his worshippers, see S'AIVAS.

SIVAS, a city of Asiatic Turkey, capital of the vilayet of the same name, is situated on the Kizil Irmak (anc. *Halys*), 60 m. s.e. of Tokat. Sivas covers a large extent of ground, is well built, has numerous old mosques, khans, gardens, and excellent bazaars, manufactures coarse woollens, and carries on a considerable transit trade. Pop. 20,000, of whom about 5,000 are Armenians, the rest Turks. Sivas is built on the site of the ancient *Sebasteia*, from which it derives its name.

SIVASH', or PUTRID SEA. See CRIMEA.

SIVATHE'RIMUM (*Siva*, an Indian god; and Gr. *therion*, a wild beast), a remarkable genus of extinct mammals, found in the miocene strata of the Sewalik hills, in northern India. It had a large skull nearly as long as that of an elephant, supported on a neck little short of that of a giraffe, but much stronger. The face was short, and the nasal bones were prolonged into a pointed arch above the external nostrils, indicating the existence of a trunk or proboscis, an organ unknown among the Ruminantia to which it belonged.

SIWAH, or EL-SIWAH. See AMMONIUM.

SIX COMPANIES, THE CHINESE, are six organizations formed by Chinamen residing in the United States, representing six divisions of the Chinese province of Quang Tung (Canton), their object being to take care of Chinamen coming from those divisions, so that the immigrants may deal with men who speak their dialect and may meet persons from their own home localities. They are partly benevolent and partly commercial societies, their function being to loan money, give advice, act as bankers, care for the sick, and protect their countrymen in all ways. Their strongest claim upon the regard of their countrymen was originally to bring back, dead or alive, the body of every Chinaman who sailed from home to this country. At the outset the business of those companies was small. They began through the operations of the American agents of a Hong Kong firm. That was in 1850 and 1851, and their first work was in hiring men in China to meet the demand for labor in California. The business grew and other Chinese firms went into it. Then the agents of all these firms found it necessary to unite for self-protection, partly to hold the business among themselves and partly to protect themselves against trickery on the part of the coolies who were in debt to them. There were six of these agencies, and they called themselves the Six Companies. They make money from the fees paid for each laborer who seeks their protection, but the fees are paid by the contractors who hire labor of them or who order Chinamen brought to these shores—to the United States formerly, and now to Canada. The names of the Six Companies are, in the order of their size and importance, the Ning Yeung, twice larger than any other; the Hop Wo, the Kong Chow, the Yung Yo, the Sam Yip, the Yang

Wo. They are secret societies only from the point of view of the ignorant; to the rest they do not differ widely in their main design from the societies which the white men themselves established in California during the gold fever, when people from every State in the union had their headquarters there. The Chinese have added arbitration bureaus and banking operations to the original scheme of their companies.

SIX NATIONS. See IROQUOIS.

SIXTUS, the name of five popes, of whom two call for particular notice, Sixtus IV. and Sixtus V. The former (originally named Francesco della Rovere), b. July 22, 1414, was a native of a small village near Savona, and a member of a very humble family. He was a scholar of the celebrated cardinal Bessarion, and became a member of the Franciscan order, in which capacity he obtained the highest reputation throughout Italy as a preacher. On the death of Paul II. in 1471, Rovere was elected to the Roman see. The domestic government of Sixtus has been strongly condemned. His inordinate partiality to his relatives exhausted the papal treasury, and led to many questionable exactions, and to gross abuses in the dispensation of church patronage. His excessive facility, too, in dispensing favors, led to his not unfrequently conferring the same benefice on more than one individual. But the worst imputation upon the memory of his pontificate arises in connection with the political affairs of Florence, and especially with the conspiracy against the Medici family, known in history as the Pazzi conspiracy. In the last act of this nefarious plot, the murder of Giuliano in the church at Florence, Sixtus's nephew, Riasio, was present, and when, after its failure, the leaders, including the archbishop of Pisa, were executed, Sixtus excommunicated the duke Lorenzo and all the magistrates of the city. Although this censure was passed professedly for the violation of the immunities of the church in putting an ecclesiastic to death, yet it has drawn upon Sixtus the suspicion of complicity, or at least of connivance after the fact; and has led to much controversy among historians. The necessities of defense against the Turkish invasion embarrassed still further the finances of the pope, and even the Catholic historians deplore the lengths to which ecclesiastical exactions and the simoniacal distribution of benefices were carried in the latter years of Sixtus. In many respects, nevertheless, his administration was liberal and public spirited. He did much to foster learning and to encourage art. Under him, the Vatican library continued to increase, and he contributed notably to the improvement and decoration of the city. In 1482 he entered into an alliance with the Venetians against the duke of Ferrara, which led to a general Italian war, and ended in a dissolution of the Venetian alliance, so mortifying to the pope, that his death is said to have been caused by chagrin and mortification, Aug. 13, 1484.—**SIXTUS V.**, in many respects, one of the most remarkable of modern occupants of the Roman see, originally named Felice Peretti, was born (Dec. 13, 1521) near Montalto, of parents so poor that his boyhood was spent in the humble occupation of a swineherd. While thus engaged, the boy attracted the notice of a conventual Franciscan father, who procured his admission into the order. He was ordained priest in 1545, and became professor of theology at Siena. His reputation as a preacher led to his being transferred to Rome, where he rose to its first dignities. He accompanied cardinal Buoncompagno as theologian in his legative mission to Spain (1565); and on the accession of Pius V. to the pontificate, was named cardinal (1570). On the accession of his former patron, Buoncompagno, under the name of Gregory XIII., cardinal Montalto might have exercised the highest influence, but he lived a retired and mortified life, and was believed to have fallen almost into the decrepitude of age and infirmity. This appearance was afterward ascribed by his enemies to the design of concealing his ambitious views; and there is a well-known but apocryphal story of his having, when elected pope on the death of Gregory in 1585 (April 24), flung aside his crutch, and revealed himself to the astonished cardinals in the full vigor of his physical strength and his moral character. His pontificate, however, was a most active and energetic one, and was marked by vigorous measures of improvement in every department of administration, ecclesiastical as well as civil. His first care was to repress the prevailing license and disorder of the city of Rome, and of the papal states generally, by effectually breaking up and exterminating the lawless bands of outlaws by which both were infested. His administration, both in this matter and in the repression of immorality, was rigorous perhaps to the extreme of cruelty; but the evil was one which seemed to call for extreme remedies. He reformed the administration of the law, and the disposal of public patronage; and he entered upon numerous and most comprehensive projects for the moral and material improvement of Rome. Many of his great works are still recognizable at Rome under his name, and are popularly remembered as his; among which are the library buildings of the Vatican. A distinguishing characteristic of his administration, too, was its disinterestedness. He steadfastly refused to use his position for the purpose of advancing any of his relatives, or to bestow upon them property or money derived from the public; and by judicious retrenchment he secured within the first years of his short pontificate a surplus of above 5,000,000 of crowns. It is of course impossible to enter into the details of his foreign policy; it will be enough to say that its great aim was, in the strongest sense of the words, to advance the cause of the Roman Catholic church in every portion of Christendom, against the Huguenots in France, against the Lutherans in Germany, and against queen Elizabeth in England. At the same time, he entertained a deep jealousy and apprehension of the designs of Spain; and he resisted persistently the excessively rigorous measures of the

Spanish inquisition as organized under Philip II. His church administration was equally vigorous and energetic. He fixed the number of the sacred college of cardinals at 70; and it was under him that the present organization of separate congregations of cardinals for the several departments received some of its most important developments. He published a new edition of the Septuagint, and an edition of the Vulgate, which has become famous from the multiplicity of its errors, subsequently corrected in the edition of Clement VIII. Many of the popular stories regarding him are derived from Gregorio Lete's *Vita di Sisto V.* (2 vols., Lausanne, 1669), a work of no authority. See also Tempesti, *Storia della Vita e Gestì de Sisto V.* (2 vols., Rome, 1754); Lorentz, *Sixtus V. und seine Zeit* (Mainz, 1852); Ranke, *Fürste und Völker von Süd-Europa*, and Von Hübner, *Sixtus V.* (1874).

SIZAR (from *sizae*, in university slang, an allowance of victuals from the buttery—or the smallest quantity of anything which can be bought, a word derived from *assize*, formerly the same as *assess*, to apportion), a name given to an order of students at Cambridge and Dublin universities, who are admitted on easier terms than others. Duties of a somewhat menial kind were originally required to be performed by the sizars, but these have long since gone into disuse. Sizars are not on the foundation, and therefore so long as they remain such, are not eligible for fellowships; but they may at any time become pensioners, and generally sit for scholarships immediately before taking their first degree. If successful, they are on the foundation, and may become candidates for fellowships when they have taken their degree.—At Oxford, there is a similar order of students, denominated servitors.

SIZE. See GELATINE.

SKA'GEN, CAPE, or THE SKAW, the most northerly point of Jutland, Denmark. On it is built a light-house of stone, 67 ft. high, the lat. of which is 57° 43' 8" n., long. 10° 36' 5" e.

SKAGER-RACK ("Crooked Strait of Skagen;" *rack* is probably from the same root as A.-S. *raca*, Ger. *rachen*, thus being equivalent to the Celtic *kyle* [in kyles of Bute], Lat. *gula*, English *gully*—is the *race* of Alderney allied to *rack*?), an arm of the North sea (q. v.), lying between Denmark and Norway, and communicating with the Cattegat, is about 150 m. long from w. s. w. to e. n. e., and 80 m. broad. The depth is much greater on the Norwegian than on the Danish coast, being on the former about 200 fathoms, while on the latter it varies from 30 to 40 fathoms, increasing toward the center to about 60. When free from violent storms—to which, however, it is very subject—the current runs e. on the side next Denmark, and w. on that next Norway, the harbors being all on the latter coast.

SKAGIT, co. situated in the n. w. part of Washington. Its principal stream is the Skagit river, navigable for 80 m. from its mouth. Agriculture is the leading industry; 1916 sq. m.; pop. '90, 8747. Co. seat, Mount Vernon.

SKALD (allied to *skill*; the radical sense is to separate, and hence to discern) signifies, in old Norse, a poet. The name was given specially to that class of poets who exercised their art (*skáldskapr*) as a vocation requiring a learned education; that is, a knowledge of the construction of verse, and of the enigmatical imagery, roughly shaped out of obscure tradition, to which Scandinavian poets were prone. The great, if not the only aim of the Skaldic poetry was to celebrate the deeds of living warriors or of their ancestors. For this reason princes attached skalds to their courts, and competed with each other, by magnificent presents, for the possession of the most skillful minstrels. Very few complete Skaldic poems are extant; but, on the other hand, the multitude of fragments preserved, partly in the younger Edda (q. v.), partly in the Sagas (q. v.), and the Heimskringla (see SNORRI STURLESSON), is very great. A manuscript of the younger Edda, belonging to the university of Upsala (which has been printed in the *Historia Literaria Islandica* of Einarsen), contains a list of the most celebrated Icelandic and Norwegian skalds of the 13th c., under the name of *Skáldatal*. The songs relating to the religious and heroic traditions of the north, which are found in the Edda, go back to an earlier time in which the class or school of "skalds," properly so called, did not yet exist. The authorship of these primitive Eddaic songs is unknown; but they are the sources from which the "skalds" of later times drew much of their inspiration.

SKAMA'NIA, a co. in s. w. Washington, having the Columbia river for its s. boundary, separating it from Oregon; 1636 sq. m.; pop. '90, 774, chiefly of American birth, with colored. It is drained by the Cathlapootle, Klikitat, and White Salmon rivers. The surface is mountainous. Co. seat, Stevenson.

SKAT, a German game of cards. It is of quite recent origin, being hardly more than sixty years old.

The derivation of the name is obscure, the Gothic *skatts*, the Anglo-Saxon *skatt*, the modern German *schatz* (treasure), because the two cards which are put aside become a treasure to some one of the players, all make claims. *Scart*, a term used in *Taroc*, a game of Italian origin, also comes as a claimant.

The cards in use are 32 in number, and of pleasing design. Unlike whist cards they are not double-ended. Not only the face cards, but the spot cards as well, show fully

executed figures. Three or more persons enter into the game, although but three are active players, one, the *player* playing against the other two. Each player holds ten cards, two being laid aside *in the skat*. The use of these two cards determines the two different styles of playing. With the skat, it is a simple game, or it may be *Tourné* (an order to turn up one of the cards *in the skat*), the suit of which becomes trumps. Or it may be *without* the skat, in which latter case the varieties of the game are designated as *Solo*, *Nullo*, and *Grando*.

The four suits of the cards are: *Eichlen* (acorn), signifying fruitfulness, or the autumnal season. It is the equivalent of *Clubs* in other cards. The second suit, *Grün* or *Gruen* (green), the equivalent of *Spades*, suggests Spring. *Roth* (red), the equivalent of *Hearts*, implies warmth, or the Summer season. *Schellen* (the bells), is suggestive of sleighing, or the Winter season, and is the equivalent of *Diamonds* in other cards.

These four suits are of graded value in the order named, *Eichlen* being the highest. The trumping power of the Jacks is in the same order, Jack of *Eichlen* always highest, and Jack of *Schellen* lowest. The winning of the game is reckoned principally by points, the point value in each suit being: Jacks, 2; Aces, 11; Tens, 10; Kings, 4; Queens, 3. These, multiplied by four, the number of suits in the pack, make 120, the number of points required. The *Nines*, *Eights*, and *Sevens* do not count. The *Jacks*, though highest trumps, count only two points in scoring. The game is one of points, not tricks, and the number of possible combinations is very great.

The order and valuations of the games is best explained by the following carefully prepared table:

Player taking up the two Skat Cards.....	{	Simple Game, <i>Schellen</i> , or <i>Diamonds</i> , rate.....	1
		“ “ <i>Roth</i> , or <i>Hearts</i> , rate.....	2
		“ “ <i>Grün</i> , or <i>Spades</i> , rate.....	3
		“ “ <i>Eichlen</i> , or <i>Clubs</i> , rate.....	4
		<i>Tourné</i> , <i>Schellen</i> , or <i>Diamonds</i>	5
		“ <i>Roth</i> , or <i>Hearts</i>	6
	{	“ <i>Grün</i> , or <i>Spades</i>	7
		“ <i>Eichlen</i> , or <i>Clubs</i>	8

In the following list, the valuation is increased:

The Skat not being taken up during the game, its points count for player all the same.	{	<i>Solo</i> , <i>Schellen</i> (<i>Diamonds</i>).....	9
		“ <i>Roth</i> (<i>Hearts</i>).....	10
		“ <i>Grün</i> (<i>Spades</i>).....	11
		“ <i>Eichlen</i> (<i>Clubs</i>).....	12
		<i>Grando</i> is rated at.....	16
		but must at least cost.....	48

These rates are the first cost of the game played by the successful bidder, and are reckoned in computing the cost of each particular game. There are, nevertheless, marvelous changes and variations, to be mastered only by practice.

The German Skat-terminology shorn of which the game would lose much of its flavor, is a vehicle of the humorous element in man, and as the game claims humor as its natural companion, or, to express it in another way, one of its integral parts, a few of the more prominent terms and phrases are given, with their literal as well as suggestive renderings:

Daus (deuce), meaning an excellent fellow.

Geben (to deal); *vergeben* (to misdeal).

Mauern (to lay bricks), to block the game; to play dog in the manger.

Ramsch, riff-raff, or scramble; used when no one of the three active hands is strong enough to play against the other two.

Fehlcarten, fail cards, or waste cards. The name *Ladons* is also applied.

Reichs-Skat, Imperial Skat, the outcome of the Altenburg Congress.

Grün König, King of the Green.

Schellen Sieben, the seven ball card.

Matadore, All trump cards so far as they form an unbroken sequence in the player's hand.

Wenzel, Jacks or Knives.

Vorhand, First hand, the party on the player's left to whom the first card is dealt.

Mittelhand, the second or middle player.

Hinterhand, the third player or dealer.

Schneiden, to finesse; also scalp, skin, flay.

Schneider, to cut as bad or ridiculous a figure as a tailor; to be badly beaten as a player.

(The words must not be confounded. One is a noun, the other a verb.)

Schwartz, black. When either party fails to make a trick; as in base-ball, to be whitewashed.

Tourné, Turn-over-game; to turn up one of the two Skat cards, the suit of which becomes trumps.

Postmeistern, To act like a postmaster, who, in the times of stage-coaching, had to assign the passenger's seat. They were generally inclined to hold back the more desirable seats, while making poorer ones do duty first.

Vatermörder, parricide. The *player* losing his game, the opposition banter him by placing some of the cards between their collars and necks, with the points up, signifying that the game has killed its originator.

These, with many others, constitute a series of terms and expressions that have become peculiarly associated with the game of Skat.

At the close of the year 1890, the popularity of the game had caused its recognition in every part of the world where the German influence has a foothold. It is to be found in every part of the globe, wherever three sons of the Fatherland can be found.

A *Bibliography of Skat*, between the years 1876 and 1886, was published by the house of B. Westerman & Co., New York, in which there were over 33 works enumerated regarding the game, in addition to a valuable work published by themselves, in both German and English.

SKATE, the popular name of several species of ray (q.v.)—THE COMMON SKATE (*raia batís*), known in Scotland as the *blue skate* or *gray skate*, and in the south of England as the *tinker*, is plentiful on most parts of the American coasts; the breadth of the body is to its length in the proportion of about four to three; the snout sharp; a slight concavity in the outline between the snout and the extreme lateral angle of the pectoral fin; a short hard tubercle in front of each eye, and another on the inner side of each; a single row of spines commencing on the dorsal ridge near the origin of the ventral fins, and reaching along the tail as far as the first of the two small fins which it bears; the upper parts grayish brown, the belly dusky white with darker lines. It attains a large size, having been known to weigh 200 lbs.—THE LONG-NOSED SKATE (*R. rostrata* or *mucronata*) is remarkable for the elongation and sharpness of the snout. The upper surface is of a light lead color, the lower grayish white. The tail has a row of crooked spines.

SKATES—SKATING. Skates are small keels or blades of iron or steel which are placed under the soles of the feet for the purpose of enabling the wearer to glide along the surface of ice. They are usually fitted to pieces of wood carved into somewhat of a boat-like form, to which straps of leather are adjusted, to enable the skater to attach them firmly to his feet. Of late, in some improved skates, the wood has given way to metallic fittings, which are neater, and perhaps preferable; they are, however, liable to rust, and consequently to get out of order. In America, skating is a favorite pastime in winter; and in England, and Scotland, also, it is carried to a degree of excellence not known in other countries; the skaters study the most graceful curves, and the nicest possible balancing of the body, when going at great speed. In such countries as Holland and the more northern parts of Europe skating is used merely as a necessary means of locomotion among the laboring classes. The name of *roller-skate* has been adopted for a frame for the foot, fitted on small wheels or rollers. On a specially prepared surface, such as an asphalted floor, these roller-skates permit a smooth, gliding motion somewhat analogous to that of skating. Places for this amusement (called *rinking*) have of late years sprung up all over the country, and are known as *skating-rinks*.

SKEAT, Rev. WALTER WILLIAM, b. London, 1835; educated at King's college and Cambridge, graduating in 1858 with high honors; took orders but became lecturer in Christ's college, where he became professor of Anglo-Saxon in 1878. He has devoted much study to Saxon and early English literature, and has edited many texts for the early English text society, for the Oxford press, and completed Kemble's Anglo-Saxon Gospels for the Cambridge syndics. He was one of the founders and a director of the English dialect society. Among his original works are *A Tale of Ludlow Castle*, a *Mæso-Gothic Glossary*, *Etymological Dictionary of the English Language*, and *Principles of English Etymology* (2d series, 1891).

SKELETON (Gr. *skeletos*, dry) is the term applied in anatomy to designate the hard parts or frame-work of animals. In the invertebrate animals the skeleton, except in the case of certain corals, is tegumentary or dermal, forming the outer hard and protective covering, as in the *echinodermata*, *mollusca*, and *crustacea*; and like the epidermis and its appendages, is non-vascular, and can only be increased by additions to its edges. This hard insensible covering serves to protect the animal from hurtful external influences, and to afford fixed points of attachment to the muscles which move the body and limbs; the muscles, however, always lying interior to the skeleton, and not clothing it as we see in the vertebrata. We scarcely ever observe amongst the invertebrata that the skeleton bears any definite relation to the nervous system, which is merely protected by it to the same extent as the other soft tissues. Moreover, in none of these animals are the hard parts composed of true bone.

In the vertebrate animals, although we find occasional cases of bone being deposited in various parts of the body, its most constant position is around the central masses of the nervous and vascular systems, with rays extending thence into the middle of the chief muscular masses, forming the bases of the limbs. "Portions of bone are also developed, to protect and otherwise subserve the organs of the senses, and in some species are found incasing mucus-ducts, and buried in the substance of certain viscera—as, e.g., the heart in the bullock and some other large quadrupeds. Strong membranes, called 'aponeurotic,' and certain leaders or tendons, become bony in some animals—as, e.g., the 'tentorium' in the cat, the temporal fascia in the turtle, the leaders in the leg-muscles in the turkey, the nuchal ligament in the mole, and certain

tendons in the abdominal muscles of the kangaroo, which, so ossified, are called the marsupial bones."—Owen's *Structure of the Skeleton*, p. 163. In some animals (e.g., the sturgeon, the crocodile, the armadillo), bony matter accumulates upon or near to the surface of the body, rendering the skin in some cases absolutely ball-proof.

The following is Owen's theory of the vertebrate skeleton (which, however, is not supported by embryological research—see end of article). The superficial or skin bones constitute the "dermo-skeleton" (Gr. *derma* skin); the deep-seated bones, in relation to the nervous axis and locomotion, form the "neuro-skeleton" (Gr. *neuron*, nerve); the bones connected with the sense-organs and viscera form the "splanchno skeleton" (Gr. *splanchnon*, a viscus or inward part); while those developed in tendons, ligaments, and aponeuroses are termed the "sclero-skeleton" (Gr. *skleros*, hard). In the arrangement of the various parts of the dermo, splanchno, and sclero skeletons no definite plan or law can be detected. The definite end or purpose gained by the position of the bony plates, cases, or rods, belonging to these skeletons is usually easily seen to be connected with the habits and well-being of the animals in which they occur, but the parts cannot be referred to one general type, as in the case of the neuro-skeleton. We will follow Prof. Owen in taking the sturgeon and armadillo as examples of a dermo-skeleton, and shall condense the remarks which he makes on their outer covering. The head of the sturgeon is defended by a case of superficial bony plates, and the body by five longitudinal rows of similar plates, one extending along the mid-line of the back, one along each side of the body, and two along the belly, between the ventral and pectoral fins. These fishes habitually swim low and grovel along the bottom, turning up the mud and sand with their pig-like snout, and feeding on the decomposing organic substances carried down by strong and rapid currents. The heavy dermal osseous plates, regularly arranged in orderly rows along the middle and sides of the body, act as well-arranged ballast. The protection which their plate-armor affords them against the logs and stones hurled along their feeding-grounds, renders needless the ossification of the immediate case of the brain and spinal marrow, and consequently all the parts of the neuro-skeleton remain in the flexible, elastic, gristly state common to all the so-called cartilaginous fishes; the weight of the dermo-skeleton requiring that the neuro-skeleton shall be as light as possible, consistently with the defensive and sustaining functions which it is called to perform. The coat of mail in which the ganoid fishes of an early period were clothed was probably subservient to the same ends as the dermal plates of the sturgeon; and in most of these fishes, as in the sturgeon, the dermal bones are coated externally with a very hard material resembling enamel. In these extinct fishes, the plates are more close-set than in the sturgeon, overlapping each other, and being fastened together like tiles by a peg of one entering a socket in the next, and conversely.

In the armadillo the dermal bones are small, usually five or six sided, smooth internally, and variously sculptured externally—the pattern, however, being constant in, and characteristic of, each species. They are united together at their margins by rough surfaces, and collectively resemble a tessellated pavement. To allow of the requisite movements of the trunk of the armadillo, which have the power of rolling themselves into a ball, a certain number of transverse rows are interposed, having an elastic yielding attachment with one another, and with the anterior and posterior fixed parts of the trunk-armor; and by this arrangement, the head and limbs can be withdrawn beneath the central case, by the action of strong subcutaneous muscles. In the colossal extinct armadillo (the *glyptodon*) the trunk-armor was not divided by bands, but was composed of one immovable piece, covering the back and sides—an arrangement by which the dermo-skeleton would afford increased protection against falling timber, the attacks of other animals, etc.

The splanchno-skeleton is at first sight less apparent than the dermo-skeleton. In most air-breathing vertebrates the larynx, trachea, and bronchial tubes contain a cartilaginous framework which sometimes becomes ossified; in fishes, and in the batrachians in the tadpole state, the gills are supported upon a cartilaginous or osseous framework, developed independently of the vertebral skeleton; and in many mammals the heart contains a bone that serves as a support for its muscular and ligamentous fibers. If to these parts we add the so-called "sense-capsules"—the bony cap which is found in the outer coat of the eye in many birds and most fishes; the hard bony envelope which surrounds the internal ear, and which subsequently, as the petrous portion of the temporal bone, becomes incorporated in most vertebrates with the neuro-skeleton; and the turbinate bones of the nose—and the teeth, we have the principal parts of the splanchno-skeleton. The sclero-skeleton requires no further explanation than that which has been already given; and we therefore proceed to what may be called the skeleton proper—the neuro-skeleton.

From the nature of the subject it is impossible to avoid the introduction of a considerable number of technical terms, which will probably be new, and will sound somewhat harshly to many of our readers; and as few writers can popularize a difficult subject more successfully than Prof. Owen himself (unquestionably the greatest osteologist of the present age), we shall for the most part follow the history of the neuro-skeleton, which he drew up for the benefit of general readers in *The Circle of the Sciences*. A thoughtful examination of the skeleton of any vertebrate shows that it is

arranged in a series of segments, following and articulating with each other in the direction of the axis of the body, from before backward in brutes, from above downward in man. Each complete segment, called a "vertebra," consists of a series of osseous pieces arranged according to the plan shown in Figs. 2 and 3, so as to form a bony hoop or arch above a central piece for the protection of a segment of the nervous axis; and a bony hoop or arch beneath the central piece for the protection of a segment of the vascular system. The upper hoop, N, is called the "neural arch" (Gr. *neuron*, a nerve), and the lower hoop, H, the "hemal arch" (Gr. *hæma*, blood); while their common center, C, is termed the centrum. The neural arch is formed by a pair of bones, *n*, *n*, called "neurapophyses" (Gr. *apophysis*, a projecting part or process), and by a bone, *ns*, sometimes cleft or bifid, called the "neural spine;" it also sometimes includes a pair of bones, *d*, *d*, called "diapophyses" (Gr. *día*, across). The hemal arch is formed by a pair of bones, *pl*, *pl*, called "pleurapophyses" (Gr. *pleuron*, a rib); by a second pair, *h*,

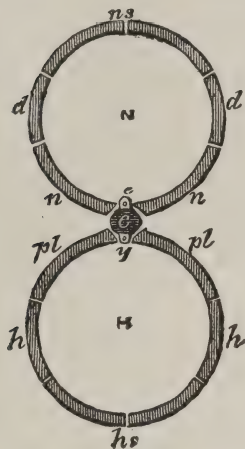


FIG. 1.—TYPICAL VERTEBRA (ideal).

(The signification of the letters is fully given in the text.)

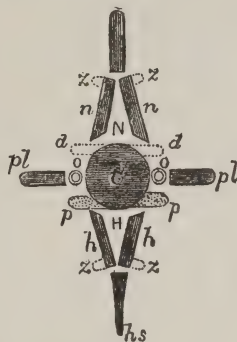


FIG. 2.—ANOTHER MODIFICATION OF A TYPICAL VERTEBRA. C, the centrum, giving off *d*, *d*, the diapophyses, and *p*, *p*, the parapophyses; the neural arch N, inclosing the spinal cord, is formed by *n*, *n*, the neurapophyses, and *ns*, the neural spine; the hemal arch H, inclosing the great centers of the circulation is formed by *h*, *h*, the hemapophyses, and *hs*, the hemal spine. From both the neurapophyses and the hemapophyses may be given off the zygapophyses, *z*, *z*. The lateral arches which may inclose the vertebral arteries *O*, *O*, are completed by the pleurapophyses, *pl*.

called "hemapophyses," and by a bone, *hs*, sometimes bifid, called the "hemal spine." It also sometimes includes parts or bones called "parapophyses" (Gr. *para*, transverse). Bones, moreover, are developed, which diverge as rays from one or more parts of a vertebra. Prof. Owen divides the various parts of a vertebra into (1) the autogenous and (2) the exogenous parts. The autogenous parts are those which are developed from independent centers of ossification (q.v.), and are termed the elements of the vertebra; while the exogenous parts are those that grow from parts previously ossified, and are termed processes. The line between these two sets of parts cannot be strictly drawn, since parts which are usually exogenous are sometimes autogenous, and *vice versa*. The autogenous parts or elements are the centrum, C; the neurapophyses, *n*, *n*; the neural spine, *ns*; the pleurapophyses, *pl*, *pl*; the hemapophyses, *h*, *h*, and the hemal spine, *hs*; while the exogenous parts or processes are the diapophyses, the parapophyses; the zygapophyses (Fig. 2), *z*, *z* (Gr. *zygos*, a junction); the anapophyses (Gr. *ana*, backward); the metapophyses (Gr. *meta*, between); the hypapophysis (Gr. *hypo*, below); and the epapophysis (Fig. 1), *e* (Gr. *epi*, upon). These individual parts may be united with each other in various ways, and may occur in various degrees of development; sometimes they (or some of them) remain entirely disjointed even in the adult animal, while in other cases they are united into a single piece, so that their real distinctness can only be recognized by tracing the history of their development. In most instances some one or more of these parts will be found to be altogether deficient, while in other cases one set of parts is exaggerated to a great degree. Thus, in the third or parietal segment of the human skeleton the neural arch is much expanded, while the hemal one is contracted; while more commonly, as in the thoracic segment or vertebra of a raven, the hemal arch is much expanded and the neural one contracted; while sometimes again, as in the tail of the crocodile and of many other animals, both neural and hemal arches are simultaneously contracted. The segments are commonly simplified and made smaller as they approach the end of the vertebral column or axis, one element or process after another being removed until the vertebra is reduced to its centrum, as in the diagram of the archetype vertebral skeleton. If we glance at the typical vertebra represented

In fig. 2, we observe the diapophyses projecting above a canal that serves for the passage of a blood-vessel, and parapophyses which form the lower boundaries of this canal. These elements never attain any high development in mammals, birds, or reptiles; thus, in the human cervical vertebra, they form the two roots of the transverse process surrounding the foramen for the passage of the vertebral artery, while in the thoracic vertebra of the bird the diapophyses form the transverse processes, and the parapophyses, reduced to mere rudiments, form the articular surfaces with which the heads of the ribs come in contact. In fishes, however, they are much developed, and in the cod tribe are even larger and broader than the pleurapophyses or true ribs. The ordinary function of these lateral processes is to afford attachment to muscles, to protect the lateral vascular trunks (as in the case of the vertebral artery), and to give support to the pleurapophyses, *pl. pl.*, whose development varies extremely in different parts of the same vertebral column, as well as in different animals. Then, in the human cervical vertebra, they form the short bifid transverse processes which are ankylosed at their base to the diapophyses and parapophyses, which surround the vertebral canal. In the thoracic segments they are developed separately, and constitute the ribs which form the greater part of the circumference of the hemal arch. Proceeding to the consideration of the parts below the centrum, we often find the entire hemal arch wanting, as in the cervical and lumbar vertebrae of man and mammals; but in the tail of some mammals and of reptiles a hemal arch, protecting the caudal artery and vein, and closely resembling a neural arch, is found. It is in the thoracic region of mammals, birds, and reptiles that we find the greatest expansion of the hemal arch; the hemapophyses here articulating with the extremities of the ribs instead of with the centrum, and the arch surrounding the entire visceral cavity. In man and mammals the hemapophyses remain unossified, and are known as the cartilages of the ribs; but in birds and reptiles they are ossified, and constitute the sternal ribs. The hemal spine, *hs*, presents great variety of form, and is often altogether absent. In the mammalian thorax it occurs as a flat sternum; in birds the flatness is replaced by a prominent keel on the mesial line, so that a transverse section almost resembles a neural spine; while in reptiles, again, the hemal spine or sternum is flattened laterally, as in mammals. The hemapophyses and hemal spine are absent in the abdominal region of mammals and birds, but are continued backward in the saurians or lizard-like reptiles, whose hemal arch is, notwithstanding, incomplete, from the absence of pleurapophyses. In serpents the hemal arches are wanting through the whole trunk, the ends of the ribs being free; and in fishes generally the hemapophyses and hemal spine are absent or unossified.

Having noticed, as fully as our space permits, the modifications which the typical vertebra undergoes in various animals, and in different parts of the same animal, we now

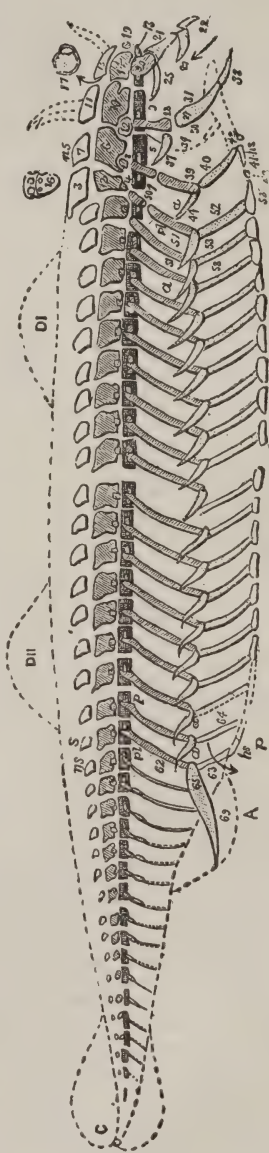


FIG. 3.—DIAGRAM OF ARCHETYPE VERTEBRATE SKELETON, composed of the following parts:

1. **Basioccipital**; 2, **Exoccipital**; 3, **Supraoccipital**; 4, **Paroccipital**; 5, **Posterior arch of the first or occipital vertebra of the head (the epencephalic arch)**; 6, **Alisphenoid**; 7, **Parietal**; 8, **Mastoid**, constituting the neural arch of the second cervical vertebra (the mesencephalic arch); 9, **Alisphenoid**; 10, **Presphenoid**; 11, **Frontal**; 12, **Post-frontal**, constituting the neural arch of the third or frontal vertebra (the prosencephalic arch); 13, **Vomer**; 14, **Prefrontals**; 15, **Nasal**, constituting the neural arch of the fourth or nasal vertebra (the rhinencephalic arch); 16, **Petrosal** or **acoustic sense-capsule**; 17, **Sclerotic**, or **ophthalmic sense-capsule**; 18, **Utriculo-tubinal**, or **olfactory sense-capsule**; 19, **Palatine**; 20, **Palatine**; 21, **Maxillary**; 22, **Premaxillary**, constituting the maxillary hemal arch; 23, 27, being its diverging appendages; 28, **Tympanic**; 29-32, **Mandibular** or **lower jaw**, constituting the mandibular hemal arch; 33, 37, **Operculars**, being the diverging appendages of this arch; 38, **Stylohyal**; 39, **Ephyal**; 40, **Ceratohyal**; 41, **Basihyal**; 42, **Glossohyal**; 43, **Urohyal**, constituting the hyoidean hemal arch; 44, **Brachioisthegal**, being its diverging appendages; 50, **Supra-scapula**; 51, **Scapula**; 52, **Coracoid**; 53, **Episternum**; 53, **Anterior member**, constituting the scapular hemal arch, with its diverging appendages; 58, **Clavicle**; 62, **Ilium**; 63, **Ischium**; 64, **Pubis**, the hemapophysis of one of the lumbar vertebrae; 65, 69, **Posterior extremity**, constituting the hemal arch of the sacral vertebra skeleton, with its diverging appendages.

come to the more difficult subject of "the archetype vertebrate skeleton," which is made up of a series of vertebræ arranged in a continuous row. The accompanying scheme or diagram represents Prof. Owen's conception of the common pattern or archetype of the vertebrate skeleton. It is difficult at first sight to see any resemblance between this figure and the human skeleton; but, in fact, the human skeleton, of all others, recedes the furthest from the common pattern; and if we turn to fishes, which were the first form of vertebrate life introduced into this planet, we find that they deviate the least from the archetypal idea. If proof be demanded that a given bone in the human skull is an element of a particular vertebra, it is afforded by tracing the same bone through its various modifications in mammals, birds, reptiles, and fishes, till the simple archetypal form is arrived at. The skull is found to be but a continuation of the backbone, and to consist of four vertebræ or segments, corresponding to the four consecutive enlargements of the nervous system, which we call the brain. These segments, reckoning them from behind forward, are termed the occipital, the parietal, the frontal, and the nasal segment. Each segment consists of a neural and a hemal arch.

The neural arches are:

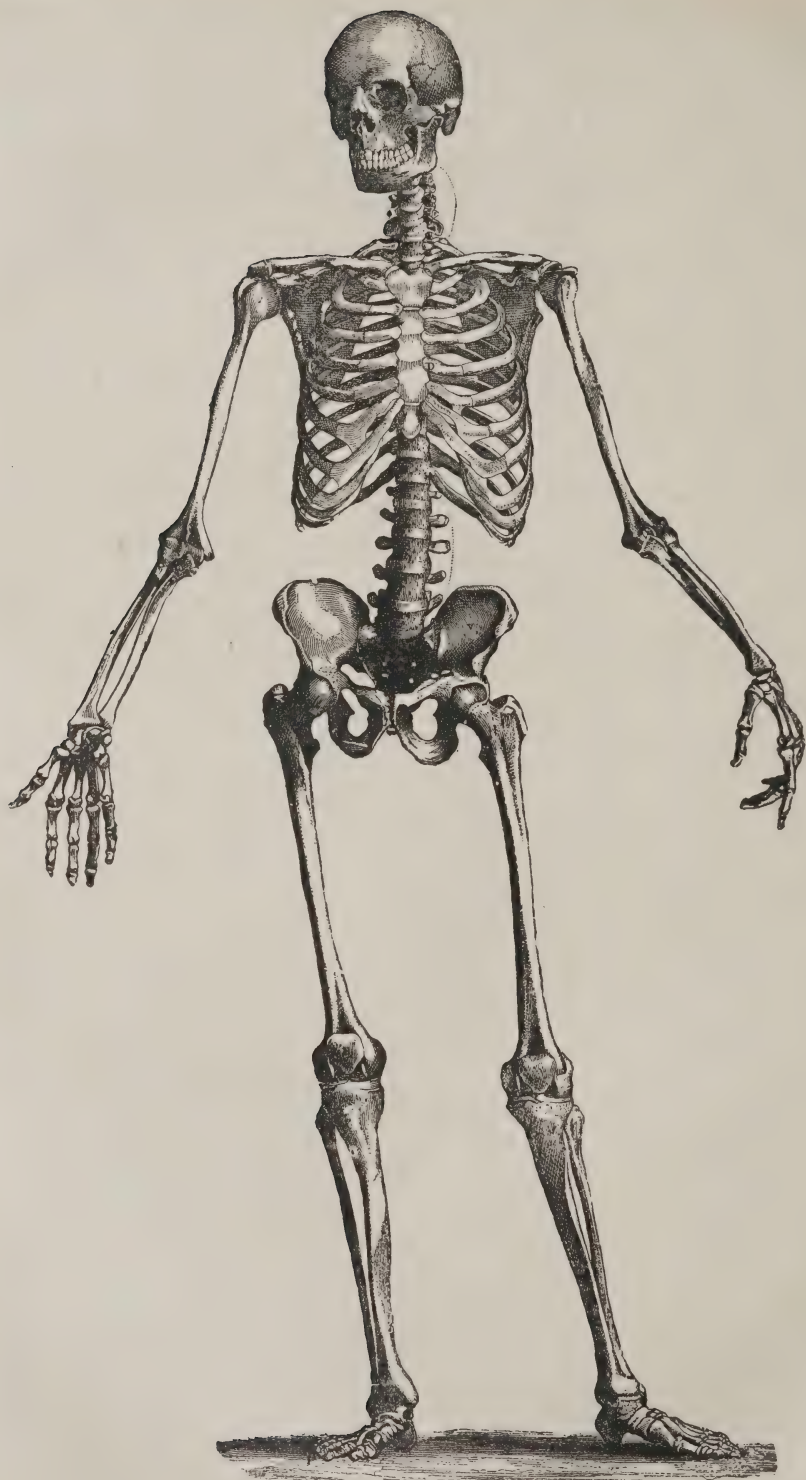
N. I. Epencephalic arch (bones Nos. 1, 2, 3, 4 in figure). N. II. Mesencephalic arch (bones Nos. 5, 6, 7, 8 in figure). N. III. Prosencephalic arch (bones Nos. 9, 10, 11, 12 in figure). N. IV. Rhinencephalic arch (bones Nos. 13, 14, 15 in figure).

The hemal arches are:

H. I. Scapular arch (Nos. 50-52). H. II. Hyoidean arch (Nos. 38-43). H. III. Mandibular arch (Nos. 28-32). H. IV. Maxillary arch (Nos. 20-22).

The jaws are the modified hemal arches of the first two segments; and the mouth opens at the interspace between these arches. The position of the vent varies (in fishes), but always opens behind the pelvic arch, S 62, 63, *p*, where this is ossified. Outlines of the chief ossified developments of the dermo-skeleton, in different vertebrates, are added by Prof. Owen to the neuro-skeletal archetype; as, for example, the median horn, supported by the nasal spine, 15, in the rhinoceros; the pair of lateral horns developed from the frontal spine, 11, in most ruminants; the median folds, DI, DII, above the neural spines, one or more in number, constituting the dorsal fin or fins in fishes and cetaceans, and the dorsal hump or humps in the buffaloes and camels; similar folds are sometimes developed at the end of the tail, constituting the caudal fin, C, and the anal fin or fins, A, of fishes.

It has been already remarked that bones which diverge as rays are formed from one or more parts of a vertebra. These "diverging appendages" are mainly connected with the hemal arches, and those which especially concern us are the pectoral appendages of the scapular arch, which become developed into fore-limbs or arms, and the pelvic appendages which are attached to their supporting hemal arch, 63, *hs*. If we examine the skull of a cod-fish, in which the bones have been arranged according to the segments or vertebræ to which they belong, we observe that the occipital vertebra has a widely expanded hemal arch, consisting of three pairs of bones with diverging appendages. The special names given by Owen to the various elements of that hemal arch, from above downward, are "suprascapular," No. 50; "scapula," No. 51; "coracoid," No. 52. The scapular arch thus formed supports and protects the heart or center of the hemal system, and in most fishes supports the pectoral fin, while in other animals the appendage that here becomes a fin is modified into a fore-leg, a wing, an arm, and a hand. Some of the special names originally employed in human anatomy are retained and applied to like parts in the pectoral fin of the fish; but it will be observed that Prof. Owen designates each bone not only by a name but by a numeral. Of the two flat bones connecting the fin with the coracoid, the upper one is the "ulna," No. 54; the lower, the "radius," No. 55, the row of short bones joined with these are the "carpals," No. 56; beyond which are the metacarpals and phalanges. Ascending from fishes to reptiles, we find that, in the lower batrachia (as the *amphiuma*), the scapulæ are detached from the occiput, and that other important modifications have occurred. The coracoids are well expanded, three segments of the diverging appendage are ossified, and two of these segments are bifid, showing a simple beginning of the radiating multiplication of parts. The first segment is the seat of these modifications, which have acquired for it the special name of "humerus;" the two divisions of the next segment of the appendage are called "ulnar" and "radius;" the gristly mass is the carpus, and the two bony divisions are the digits or fingers. We have here got so distinct a rudimentary arm, separated from the head, although, according to the views propounded in this article, an appendage of the occipital segment of the cranium, that it is unnecessary to trace the further modifications that ensue, which lead finally to the arm and hand of man. It is only necessary to remark that in mammals, except amongst the non-placental orders, the coracoid bone is reduced to a mere rudiment, being known as a process of the scapula, and that its function—namely, that of keeping the shoulders apart—is performed by the clavicle, which, according to Owen, is the hemapophysis (58) of the first cervical vertebra (see fig. 3). With regard to the pelvic arch, we have only space to add that it must be regarded as the hemal arch of one or more of the pelvic vertebræ; and there is undoubted evidence to show that the pelvic and scapular arches are constructed on the same plan; the "ileum" answering to the scapula.



The elaborate and ingenious morphological theory of the skeleton here outlined was founded entirely upon the comparison of adult structures, and has of late years been entirely disproved, in principle and detail, by actual observation of the phenomena of development. For some account of the embryological theory of the skeleton, which is now securely founded, chiefly through the labors of Huxley, Parker, and Gegenbaur, see the article **SKULL**, or Huxley's *Anat. of Verteb. Animals*; Balfour's *Embryology*, or Parker's *Morphology*. The chemical composition, structure of bone and cartilage, and their relations, will be found in the articles **BONE**, **CARTILAGE**, **OSSIFICATION**, and **SKELETON**. The human skeleton is composed of 200 distinct bones, exclusive of the 32 teeth and the three ossicles in each tympanum. See **EAR**. It is conveniently, and not unnaturally, divided into four regions: 1. the skull, composed of 22 bones; 2. the trunk, composed of 54 bones; 3. the upper extremities, composed of 64 bones; and 4. the lower extremities, composed of 60 bones. In some respects it is more natural to count 62 bones in the lower extremities, including the hip bones, as they are connected with the hip joint in much the same manner as the clavicle and shoulder-blade are with the shoulder joint. These hip bones, however, form a part of a very distinct and functionally important part of the skeleton, viz., the pelvis, and for this reason it is well to keep this division of pelvis distinct. See **PELVIS**. The skull is described under that title. The trunk may be divided into ribs, 24; vertebrae, 24; and pelvis, 4, the two lower bones of the spinal column, viz., the sacrum and coccyx, being included in the pelvis. If we include the vertebrae and sacrum and coccyx in one division, the spinal column, and the two hip bones with the lower extremities, we shall, in this view, eliminate the pelvic division. A consideration of the fact that the spinal nerves enter the sacrum and pass through orifices having the same anatomical relations as the orifices in the vertebrae, would point to the propriety of placing the vertebrae and the sacrum and coccyx together, but the physiological connection of these latter bones with the pelvis present sufficient reasons for the division here made. The trunk has also 1 sternum, or breast bone, and 1 hyoid, or tongue bone (see **HYOID BONE** and **TONGUE**), making in all 54 bones. The ribs are described under that title. They are shown in the cut, 12 on each side; 7 true and 5 false or floating ribs. The true ribs are joined to the sternum, which is seen to consist of 3 pieces, viz., the manubrium, the gladiolus, and the ensiform cartilage. The manubrium is the heart-shaped piece to which the internal ends of the clavicles or collar-bones are joined, their external ends being articulated with the shoulder-blade, or scapula, at the shoulder joint, as seen in the cut. See **CLAVICLE** and **SCAPULA**. The gladiolus is the middle piece of the sternum, with which the 7 true ribs articulate. The ensiform cartilage is the small spatula-shaped piece seen pointing downward into the triangular space between the cartilages of the 5 floating or false ribs. The vertebrae are described in the article **SPINAL COLUMN**. The pelvis (basin) is seen in the middle of the figure supporting the vertebral column, and forming with the thigh bones the hip joints. The upper extremity is divided into bones of the shoulder, 2, clavicle and scapula; of the arm, 1, the humerus (q.v.); of the fore-arm, 2, the radius and the ulna; of the wrist or carpus, 8; of the metacarpus, 5; and of the phalanges or finger bones, 14 = 32 bones in each upper extremity, or 64 in both. For a description of the bones of the upper extremity see **HAND**. Passing to the lower extremities, we observe the femur (q.v.). Its condyles are seen to be partly covered in front by the knee-pan or patella (q.v.). Below this are seen the bones of the leg. The strong bone on the inner side of each leg is the tibia. Its upper expanded extremity or head forms with the condyles of the femur the knee joint, and its lower expanded extremity forms with the astragalus, one of the instep bones, the greater part of the ankle joint. See **LEG** and **FOOT**. There are 7 bones in each instep, or tarsus, 5 in the metatarsus, and 14 in the toes, or phalanges, making in all 26 bones in each foot. These, with the leg, patella, and femur, comprise 30 bones for each lower extremity, or 60 for both.

SKELLIGS, THE, three rocky islands on the west coast of Ireland, about 8 m. west of Bolus Head, co. Kerry, in long. $10^{\circ}33'$ west. The lights on the Great Skellig are the first visible to ships crossing the Atlantic.

SKELTON, JOHN, an early English satirical poet, is supposed to have been born about the year 1460, but whether in Norfolk or Cumberland is uncertain. He studied at both Cambridge and Oxford, and received from each the academical honor of laureate. His sovereign, Henry VII., appointed him tutor to the young prince Henry, afterward king Henry VIII.; and Erasmus, in allusion to his learning, styled him the light and grace of British scholars. At this time Skelton had produced some translations, written elegies on Edward IV. (1483) and the duke of Northumberland (1489), and was author of some stiff court masques and allegorical poems of little or no merit. He entered the church in 1493, and became rector of Diss in Norfolk, shortly after which he seems to have struck into that vein of original vernacular poetry, addressed to the multitude, for which he is unique among our elder bards, and which helped to fix our language. It consists in a flow of rattling voluble verse, unrestrained satire and jocularity, and a profusion of grotesque imagery mixed up with Latin and slang phrases. At times Skelton has gleams of bright fancy and snatches of pleasant description. Of this higher class is his *Philip Sparrow*, being a poetical lamentation made by a young maiden (whose charms the poet describes with great gusto and minuteness) over the loss of a pet

bird slain in a convent of black nuns at Carowe near Norwich. The most humorous of his pictures of low life—often coarse enough—are found in the piece entitled *The Tun-ting* [or brewing] of *Elynor Rummyng*, an ale-wife at Leatherhead in Surrey. This poem was highly popular, and was often reprinted in black-letter, garnished with a rude wood-cut representation of the fat hostess. His best satires are *Colin Clout*, and *Why Come Ye not to Court?* The former is a general satire on the clergy; and the latter, a virulent attack on cardinal Wolsey, whom the unscrupulous poet had previously flattered, but who had disappointed him of a prebend which he coveted. In this scurrilous lampoon, Wolsey is not only charged with arrogance, avariciousness, and incontinence, but is reminded of his "base original" and "greasy genealogy," having been "cast out of a butcher's stall." The enraged cardinal ordered his libeler to be arrested, but Skelton took refuge in the sanctuary at Westminster, and received the protection of abbot Islip. From this retreat he did not dare to emerge, but continued silent under its sacred shelter till his death in 1529. The "pithy, pleasaunt, and profitable workes of maister Skelton, Poete Laureate" were collected and published in 1568, and reprinted in 1736. An edition, carefully edited by the Rev. A. Dyce, was issued in 1843, in 2 vols. 8vo.

SKEPTICISM (Gr. *skeptomai*, "I consider") strictly denotes that condition in which the mind is before it has arrived at conclusive opinions—when it is still in the act of reflecting, examining, or pondering over subjects of thought. Skepticism is therefore the opposite of dogmatism (see **DOGMA**). The notion of "disbelief" is quite a secondary meaning of the term. Among the Greeks a *skeptikos*, "skeptical," was originally only a thoughtful person, and the verb *skeptomai*, never acquired any other signification than "to consider." But inasmuch as the mass of men rush to conclusions with haste, and assert them with far more positiveness than their knowledge warrants, the discerning few of clearer vision or cooler head are often brought into collision with popular beliefs—more especially in religion, the sphere in which popular beliefs are most numerous, most positive, and most inconsiderate—and are compelled by the violent shock given to their reason to "doubt," it may be to "disbelieve," what they hear affirmed by the multitude with indefensible emphasis of speech. Thus it is that in common parlance a skeptic has come to mean an infidel, and skepticism infidelity. But the field of thought in which skepticism properly so-called has preferred to exercise itself is not religion but philosophy. Philosophical skeptics in all ages and countries have generally denied or at least doubted the trustworthiness of the senses as vehicles of absolute truth, and so have destroyed the very possibility of speculation. In ancient times Pyrrhon (q.v.), in modern, David Hume (q.v.), are the most characteristic representatives of this kind of skepticism.

SKERRIES, THE (skerry is a term for any isolated sea-girt rock), small islands about 2 miles off the n.w. coast of Anglesey, having a light-house 117 ft. high. See also **PENTLAND FIRTH**.

SKER RYVORE is the chief rock of a reef which lies about 10 m. s.s.w. of the s.w. point of the island of Tiree (q.v.), and 24 m. w. of Iona. This reef, which stretches from 8 to 10 m. in a w.s.w. direction, is composed to compact gneiss, worn smooth by the constant action of the waves, and was long a terror to mariners, having caused the loss of one ship annually for forty years previous to 1844. The northern light-house commission had long intended the erection of a light-house on Skerryvore, the only point of this dangerous reef which could afford the needful foundation; but the difficulty of landing on the rock, from the immense force (three tons to the superficial foot) with which the Atlantic waves beat upon it, caused the delay of the scheme till 1834, when preparations were made in earnest. The design and superintendence of the construction of the building were intrusted to Mr. Alan Stevenson, who commenced operations on the rock in 1838, following generally the mode adopted by his father, Mr. Robert Stevenson (q.v.), in the construction of the Bell rock (q.v.) light-house; and, in spite of occasional disasters from tempests, completed his work in 1844. The light-house is 138½ ft. high; at the base 42 ft., and at the top 16 ft. in diameter. The light, a revolving one, is produced by the revolution of eight large annular lenses round a lamp of four wicks, according to Fresnel's first dioptric system, and can be seen at a distance of 18 miles. The cost of erection was close upon \$435,000. Skerryvore light-house is nearly ½ higher than that on the Bell rock, and more than twice as high as the Eddystone.

SKETCHLEY, ARTHUR (the assumed name of GEORGE ROSE), 1830-82; b. Eng.: began as a clerk in the custom house; subsequently entered as a commoner at Oxford, where he obtained the usual degrees. He took orders in the Anglican church, but resigned on his conversion to Roman Catholicism, 1845, and was for five years tutor to the Duke of Norfolk. He was the author of a number of light comedies, and of a series of popular papers in which "Mrs. Brown," the type of the meddling, gossiping, and fussy Englishwoman of the middle classes, was made to deliver her opinions on various topics of the day.

SKEW-BRIDGE, a bridge placed obliquely so as to cross a road or river at an angle not a right angle. Such bridges, built of stone, are not easy of construction, owing to the peculiar twisted forms which the voussoirs assume, and were scarcely ever used till the necessities of railway curves compelled their introduction. They are evidently a

great improvement on the old-fashioned mode of twisting a road, first to the right, and then to the left, in order to get the bridge at right angles to the place to be crossed. Since the introduction of iron girders as the supports of bridges, skew-bridges have become easy of construction, and are now quite generally used.

SKIBBEREEN, a market-t. of the county of Cork, Ireland, and situated in lat. $51^{\circ} 34'$ n., long. $9^{\circ} 16'$ w., distant from Cork 42 m. s.w. It is a place of little commerce, and almost entirely without manufactures. The pop. in 1891 was 3269.

SKID, in military and naval language, is any timber which is used as a base to keep one object from resting on another. Thus, a row of cannon in store will be kept from the ground by skids.

The term is also applied to the drag which is put on the wheels of carriages in going up hills, to prevent rolling backward.

SKID DAW, a mountain in Cumberland, near the center of the county; height, 3,054 feet. A few miles to the s. lie Derwent Water and the town of Keswick.

SKIMMER, a name applied to several species of the genus *rhynchops* of the gull family (*laridae*, q.v.). The genus has the following characteristics: Bill longer than the head, nearly or quite straight, compressed laterally to the end. Lower mandible nearly one inch longer than the upper, and square at the point. Upper mandible grooved for the reception of the lower. The mechanism is remarkable, being adapted to cut like scissors, and the bird is sometimes called *scissor-bill*. The wings are very long and narrow, with the first quill the longest; tail moderate and forked; feet moderately long and slender, with an indented web; hind toe elevated, and claws curved and sharp. *R. nigra* is the *becan-ciseaux*, and *coupeur d'ear* of the French; shear-water, cut-water, skimmer, and black skimmer of the United States, and the *piscator* of the Chilians. The male is about 19 in. long; closed wings extend 4 in. beyond the tail; alar expansion, 44 inches. Length of the lower mandible four and a half inches; upper, three and a half; both mandibles red, tinged with orange and tipped with black. Upper part of the head, neck and back, and scapulars black; wings the same except the secondaries, which are white on the inner vanes, and also tipped with white. The forked tail having black feathers, broadly edged on either side with white; tail coverts white on the outer sides; black in the middle, front, cheeks, neck below the eye, throat, breast, and all the lower parts white. Legs and webbed feet red. The female is 16 in. long, with 39 in. wing expansion; plumage similar to that of the male, except the tail, which is white shafted and broadly centered with black. Mr. Nuttall says that it is a bird of passage in the United States, appearing in New Jersey, its most northern limit as he thinks, from its tropical quarters in early May; and he believes it passes the breeding season along the whole of the southern coast of the United States. Their nests have been found along the shores of cape May about the beginning of June. They are made by scratching a hollow in the sand. There are usually three eggs, which are nearly two inches long by one in diameter; white with brown blotches, some of them large.

SKIMMERTON. See CHARIVARI.

SKIN. Considered in its general physiological and histological (or textural) relations, the skin is merely a part of the great mucous system to which the mucous membrane and secreting glands also belong, and which consists of two essential elements—a *basement tissue*, composed of simple cutaneous membrane, and an *epithelium* of nucleated particles resting on it—while beneath the basement membrane are vessels, nerves, and connective tissue. See EPITHELIUM and MUCOUS MEMBRANES. In the skin, the hard and thick epithelium is termed *cuticle* or *epidermis*, and the true skin below it is termed the *derma* or *cutis vera*, and is chiefly formed of modified and very dense connective (or areolar or cellular) tissue.

The external surface of the skin formed by the cuticle is marked by furrows of different kinds. Some (termed furrows of motion) occur transversely in the neighborhood of joints, on the side of flexion; others correspond to the insertion of cutaneous muscles; while others, of quite another kind, are seen in aged and emaciated persons, and after the subsidence of any great distention of the integument; and besides these coarse lines, most parts of the skin are grooved with very minute furrows, which assume various courses in relation to one another. These minute furrows are most distinctly seen on the palmar aspect of the hand and fingers, and on the sole of the foot. The outer surface of the skin also presents innumerable pores for the discharge of the contents of the sudoriparous and sebaceous follicles, or the sweat and fat glands; and the modifications of epidermis known as hair and nails occur on the same surface.

The deep layer of the skin consists of connective tissue, in which both the white and yellow fibrous elements are considerably modified as to the proportions in which they occur, and smooth muscles are present in no inconsiderable quantity in some parts of the skin. Where great extensibility, with elasticity, is required, the yellow (elastic) element predominates; and where strength and resistance are specially required, as in the sole of the foot, the *cutis* is chiefly composed of a dense interweaving of the white (inelastic) element. The thickness and strength of this layer differ greatly in different parts, according to the amount of resistance required against pressure. The skin is

thicker on the hinder surface of the body than in front, and on the outer than on the inner sides of the limbs. "It is unusually thin over the flexures of the joints. It is particularly delicate in the eyelids, and proportionably so in some other situations where great mobility is demanded. In regions which are most subject to external pressure, as the soles of the feet, it is firmly united by very dense laminae to the sub-cutaneous fascia; and the intervals between these are provided with pellets of fat, forming a cushion, as an additional means of protection to the delicate organs it incloses and covers. Among the lower animals we may notice numberless examples of an analogous kind."—Todd and Bowman's *Physiological Anatomy and Physiology of Man*, vol. i. p. 407. The blubber of the whale merely represents, in a very exaggerated form, the layer of fat which generally occurs in the sub-cutaneous areolar tissue of man and most animals, serving as a soft bed on which the skin may rest, and gives the appearance of plumpness and symmetry to the outline of the body. It is on the external surface of the cutis that the *tactile papillae*, or true organs of touch, are developed. Kölliker divides the true cutis into the "reticular" and "papillary" portions, the latter being the reddish-gray external superficial layer which contains the upper portion of the hair follicles and cutaneous glands, and whose most important element is these tactile papillae. They are most abundant and largest in the palm of the hand* and the sole of the foot, while in the back and in the outer sides of the limbs they are almost entirely absent. They occur as small, semi-transparent, flexible elevations, which are usually conical or club-shaped in form; but in certain parts, as the palm of the hand, present numerous points (in which case they are termed compound papillae).

The thickness of the true skin varies, according to Kölliker, from $\frac{1}{8}$ of a line to a line and a half. In its chemical characters it agrees with those of the connective tissue, of which it is principally composed. The gelatine which it yields on boiling is derived mainly from the white fibrous tissue, and it is probably this element which is principally concerned in the changes which skin undergoes in the process of tanning. Arteries from the sub-cutaneous connective tissue freely enter into the structure of the skin, and are distributed to the fat-lobules, the sudoriparous and sebaceous glands (presently to be described), hair follicles, papillae, etc. In these several parts they terminate in a close network of capillaries. Those parts of the skin which border upon the epidermis are for the most part very freely provided with nerves, while in the deeper parts the nervous filaments are comparatively scanty. How they terminate is still a subject of dispute; but the view most generally adopted is that they end in loops.

The glands occurring in the skin next claim our consideration. They are the *sudoriparous* or sweat glands, the *sebaceous* or fat glands, and the *ceruminous* glands. The sweat glands exist in almost every part of the human skin. They lie in small pits in the deepest parts of the true skin, and sometimes entirely below the skin. Their orifices can be seen in the middle of the cross grooves that intersect the ridges of the papillae on the hands and feet, their arrangement being here necessarily regular, while in other parts they are irregularly scattered. Their size and number in different regions of the skin correspond with the amount of perspiration yielded by each part; thus they are nowhere so much developed as in the axilla or armpit. In that part of this region, which in the adult is more or less covered with hair, they form a layer of a reddish color, of about an eighth of an inch thick. They are soft, and more or less flattened by their pressure on one another, being imbedded in delicate connective tissue, and covered and permeated with a net-work of capillaries. On isolating one of these glands, and highly magnifying it, it is found to consist of a solitary tube, intricately raveled, one end of which is closed, and hidden within the glandular mass, while the other emerges from the gland. The wall of the tube consists of an outer or *basement membrane*, with which the blood-vessels are in contact, and an *epithelium*, lining the interior, the former disappearing when the tube reaches the surface of the papillae. The duct, on leaving the gland, follows a meandering and rather spiral direction through the reticular portion of the cutis to the interval between the papillae, when it becomes straight; and it again assumes a spiral course in perforating the cuticle. It is not easy to explain how or why so beautifully regular a spiral form should be given to the cuticular portion of the duct, which is rather wider than the rest, the average diameter of the duct being $\frac{1}{1700}$ of an inch.

The *sebaceous glands* are small whitish glands, which exist in almost every part of the skin, except the palms and soles, and are especially abundant in the scalp, face (the nose being particularly rich in them), and about the anus. They are usually connected with the hairs, and consist of a duct terminating in a blind pouch-like or pear-shaped extremity. The *basement membrane* of these glands is lined by an epithelium, in the particles of which are included granules of fatty or sebaceous matter, which, having become detached, constitutes the secretion. These glands are the seat of the parasite known as *acarus folliculorum*.

The *ceruminous glands* are brown simple glands, in external appearance like the sudoriparous glands, occurring in the cartilaginous portion of the external meatus of the ear. They yield an adhesive bitter secretion, which protects the membrane of the tympanum from the access of dust, insects, etc.

* In one square line of the palm of the hand, E. H. Weber reckons that there are 81 compound, and from 150 to 200 smaller papillae, arranged in tolerably regular rows.

We shall conclude by taking a brief survey of the functions of the skin, omitting, however, its most important function, touch (q. v.). Regarded as a protective covering, the skin possesses the combined advantages of toughness, resistance, flexibility, and elasticity; the connective framework being the part which mainly confers these properties, although the epidermis co-operates with it. The subcutaneous layer of fat, and the modifications of epidermis in various forms, as hairs, wool, feathers, scales, etc., serve for the preservation of warmth, and occasionally (when they occur as claws, talons, etc.) as means of offense or defense. The skin is the seat of a twofold excretion, viz., of that formed by the sudoriparous glands, and that formed by the sebaceous glands. The fluid secreted by the sudoriparous glands is usually formed so gradually that the watery portions of it escape by evaporation as soon as it reaches the surface; but in certain conditions, as during strong exercise, or when the external heat is excessive, or in certain diseases, or when the evaporation is prevented by the application of a texture impermeable to air, as for example oiled silk, or the material known as mackintosh, or india-rubber cloth, the secretion, instead of evaporating, collects on the skin in the form of drops of fluid. When it is stated that the sweat contains urea, lactates, extractive matters, etc., and that the amount of watery vapor exhaled from the skin is, on an average, 2½ lbs. daily (according to Valentin's observation), the importance of the sudoriparous glands as organs of excretion will be at once manifest. Moreover, there is reason to believe, from the experiments of Scharling, Gerlach, and others, that the importance of the skin as a *respiratory* organ is far from inconsiderable, very appreciable quantities of carbonic acid being exhaled hourly by the external surface of the body. In the amphibia, in which the skin is thin and moist, the cutaneous respiration is extremely active; and that the respiratory function of the skin in the higher animals is also considerable, is proved not only by measuring the excreted carbonic acid, but by the fact that if the skin is covered with an impermeable varnish, or if the body be inclosed, all but the head, in a caoutchouc dress, animals soon die, as if asphyxiated, their heart and lungs being gorged with blood, and their temperature before death gradually falling many degrees. The secretion of the sebaceous glands is a semi-fluid oily mass, which often solidifies into a white viscid tallow-like matter on the surface or in the glandular ducts, from which it can be removed by pressure, in a form resembling that of a small whitish worm or maggot. Under the microscope, cells containing fat, free fat mixed with epidermic scales, and sometimes crystals of cholesterol, are observed. Its chemical constituents, in addition to water, are a peculiar nitrogenous matter resembling casein, fat (consisting of palmitin and olein, soaps composed of palmitic and oleic acids), cholesterol, earthy phosphates, and chlorides and phosphates of the alkalies. Its purpose seems to be that of keeping the skin moist and supple, and by its oily nature, of hindering too rapid evaporation.

The skin is, moreover, an organ of absorption: mercurial preparations, when rubbed into the skin, have the same action as when given internally. Potassio-tartrate of antimony, when rubbed into the skin in the form of ointment or solution, may excite vomiting, or an eruption extending over the whole body, and many other illustrations might be given. The effect of rubbing is probably to force the particles of the matter into the orifices of the glands, where they are more easily absorbed than they would be through the epidermis. It has been proved by the experiments of Madden, Berthold, and others, that the skin has the power of absorbing water, although to a less extent than occurs in thin-skinned animals, such as frogs and lizards. This fact has a practical application. In severe cases of dysphagia—difficult swallowing—when not even fluids can be taken into the stomach, immersion in a bath of warm water, or of milk and water, may assuage the thirst. Sailors, also, when destitute of fresh water, find their urgent thirst allayed by soaking their clothes in salt water.

The *diseases* of the skin, and their classification into genera and species, have occupied the attention of many of the most eminent physicians during the last century; but none of the proposed classifications are very satisfactory. See ECZEMA; ECTHYMA.

SKIN GRAFTING. In cases of extensive destruction of the skin, leaving large sores that do not heal, and also in treating old ulcers; small particles of skin, cut from the patient or another person, are placed upon the sore. Here they soon become attached and grow, forming a number of small islands or patches of skin over the surface of the ulcer; these in time spread till the whole raw surface is covered. By this grafting process, some sores that would never heal can be rapidly cured. The patches of skin used are about the size of a large pin's head, and placed on with the raw surface next to the sore. Skin from a colored person has been transplanted to a white person, and is found to produce a white skin. See RHINOPLASTIC OPERATION.

SKINK, or SCINK, *Scincus officinalis*, a saurian reptile, found in the north of Africa, and in some parts of Asia. It is from 6 to 8 in. long, generally of a reddish-dun color, with darker transverse bands, a wedge-shaped head, and four pretty strong limbs. It has been in great repute for imaginary medicinal virtues from remote times; it was largely imported on this account into ancient Rome, and is still in high esteem in the east, dried skinks finding a ready sale in many places, as Cairo and Alexandria. There is almost no disease for which it has not been supposed to be a cure. See *illus.*, **REPTILES**, ETC., vol. XII.

SKIN-MOTH, a name given to certain coleoptera which attack skins and furs, and prepared animals in zoological collections. The most common are *dermestes vulpinus*, *dermestes lardarius*, and *anthrenus museorum*. The two first mentioned of these insects are less than a quarter of an inch long, and are very destructive, both in the larval and imago condition. The *anthrenus* is only about one-tenth of an inch long. The best antidote for them all is benzine.

SKINNER, THOMAS HARVEY, D.D., LL.D., 1791-1871; b. N. C.; graduated at Princeton college in 1809; studied law for 18 months; was licensed to preach in 1812; was colleague of Dr. Janeway, Philadelphia, 1813-16; pastor of the Fifth Presbyterian church, Philadelphia, 1816-32; professor of sacred rhetoric at Andover theological seminary, 1832-35; pastor of Mercer st. church, 1835-48; professor of sacred rhetoric and pastoral theology in Union theological seminary, New York, from 1848 to his death. He published *Religion of the Bible*; *Aids to Preaching and Hearing*; *Hints to Christians*; *Religious Life of Francis Markoe*; *Vinet's Pastoral Theology and Homiletics* (translated); *Discussions in Theology*.

SKIRMISHERS are soldiers operating in loose array, two together—i.e., front and rear, with a lateral distance of about six paces between the files. When the army advances, the ground in front, and for some distance on each flank, is usually covered by skirmishers, to prevent surprise. If cavalry come suddenly on them, they rush together, and form small squares, called rallying squares. Skirmishers fire independently at their own discretion; but the rule is, that one of the two men composing a file should always have his rifle loaded. Orders are communicated by the sound of bugle.

SKIRRET, *Sium sisarum*, a perennial plant of the natural order *umbellifera*, a native of China and Japan, but which has long been cultivated in gardens in Europe for the sake of its roots, which are tuberous and clustered, sometimes 6 in. long, and of the thickness of the finger. They are sweet, succulent, and nutritious, with a somewhat aromatic flavor, and when boiled, are a very agreeable article of food. A kind of spirituous liquor is sometimes made from them. Good sugar can also be extracted. Skirret was at one time more cultivated in Britain than it is at present, although there seems to be no good reason for its having fallen into disrepute. It is propagated either by seed or by very small offsets from the roots. It has a stem of 2 to 3 ft. high; the lower leaves pinnate, with oblong-serrated leaflets, and a heart-shaped terminal leaf, the upper ones ternate with lanceolate leaflets.

SKOBELEFF, MIKHAIL DIMITRIEVITCH, 1841-82; b. in the dist. of Raizan near Moscow; d. Moscow. He attended the military acad. of St. Petersburg, but was dismissed, 1861, and was sent with a regiment into Poland. His career began, 1873, in Turkestan, where he was prominent in the Khiva expedition. He was made colonel, and soon afterwards went to Spain, where he fought in the Carlist war. He returned to Turkestan and greatly distinguished himself, rising to the rank of general, 1875. In the second war with Khokan he commanded the expedition, and compelled the Khan to surrender. When Khokan was annexed to Russia, 1876, he was made governor. In the war with Turkey he commanded one of the Russian divisions, and won world-wide fame before Plevna. His last service was the capture of Goek Tepe, a stronghold in Turkestan.

SKOPIN', a t. of Russia, government of Riazan, and 160 m. s.e. of Moscow, is situated on the Verda, a tributary of the Oka, which is itself a tributary of the Volga. It has a trade in grain, hemp, oil, meat, salt, corn, and cattle. Pop. '93, 13,654.

SKOWHEGAN, town and co. seat of Somerset co., Me.; on the Kennebec river, and the Maine Central railroad; 37 miles n. of Augusta. It contains a high school, public library, Memorial hall, co. law library, electric-light plant, electric railroad connecting with Norridgewock, waterworks, and national and savings banks. The river here falls about 30 feet, affording excellent power for manufacturing, the principal articles being woolen goods, pulp, lumber, shoes, carriages, grist, coffins and caskets, oil-cloth, woodwork, and planing and molding mill products. Pop. '90, 5068.

SKU'A, or SKUA GULL, *Lestris*, a genus of birds of the family *larinæ*, also known by the name JÄGER (Ger. hunter), and differing from the gulls in having the upper mandible more hooked at the tip, and the nostrils larger and further forward in the bill, the base of which is covered with a cere. The skuas are bold and powerful birds, and generally obtain their food by pursuing gulls or terns, and causing them to disgorge the fish which they have captured, which they dart upon and seize in the air. They also eat eggs and small birds. The COMMON SKUA (*L. cataractes*) is fully 2 ft. in length, of a brown color, with lighter streaks on the head and neck. It inhabits the northern seas, and breeds in some of the Shetland isles.

SKULL. The skull is divided into two parts, the cranium and the face. In human anatomy, it is customary to describe the former as consisting of 8 and the latter of 14 bones; the 8 cranial bones, which constitute the brain-case, being the *occipital*, *two parietal*, *frontal*, *two temporal*, *sphenoid*, and *ethmoid*; while the 14 facial bones are the *two nasal*, *two superior maxillary*, *two lachrymal*, *two malar*, *two palate*, *two inferior turbinated*, *omer*, and *inferior maxillary*. The bones of the ear, the teeth, and the Wormian bones are not included in this enumeration. The morphologist, however, who wishes to trace

out the fundamental similarity of type in the structure of the various modifications of the vertebrate skull, will not be content with this arrangement, in which, as, for example, in the occipital, temporal, and sphenoid bones, the human anatomist considers as a single bone an osseous mass consisting primarily in man, and persistently in some of the lower vertebrates, of several distinct pieces or elements. Postponing to the close of this article any remarks on the structure of the vertebrate skull generally, we shall proceed to notice the ordinary anatomical relations of the human skull. The development of the skull is a subject of great interest, not only in itself, but as throwing light on many points which the study of the adult skull would fail to explain. At a very early period of fetal existence, the cerebrum is inclosed in a membranous capsule external to the dura mater, and in close contact with it. This is the first rudiment of the skull, the cerebral portion of which is consequently formed before there is any indication of a facial part. Soon, however, four or five processes jut from it on either side of the mesial line, which grow downward, incline toward each other, and unite to form a series of inverted arches, from which the face is ultimately developed. Imperfect development or ossification of these rudimentary parts of the face gives rise to the peculiarities known as "hare-lip" and "cleft-palate," or in very extreme cases to the form of monstrosity termed "Cyclopean," in which, from absence of the frontal processes, the two orbits form a single cavity, and the eyes are more or less blended in the mesial line.

The following is a brief summary of the succession of events that occur in the ordinary or normal development of the skull. Cartilage is formed at the base of the mem-

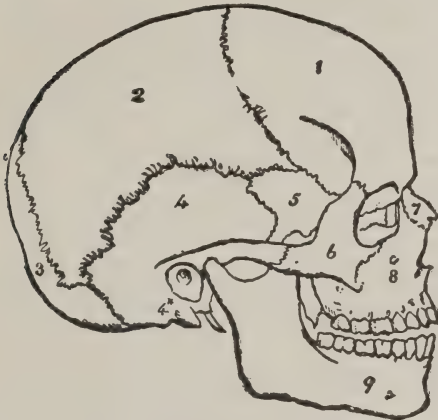


Fig. 1.—Side view of Human Skull.

1, Frontal bone; 2, Parietal bone; 3, Occipital bone; 4, Temporal bone (squamous portion); 4*, Do. (mastoid portion); 5, Sphenoid bone; 6, Malar bone; 7, Nasal bone; 8, Superior maxillary or jaw bone; 9, Inferior maxillary or jaw bone.

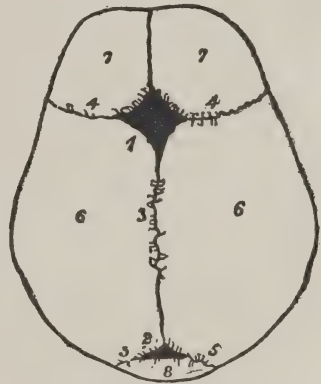


Fig. 2.

1. Anterior fontanelle; 2, Posterior fontanelle; 3, Sagittal suture; 4, 4, Coronal suture; 5, Lambdoid suture; 6, 6, Parietal bones; 7, 7, Two halves of the frontal bone, still ununited; 8, Occipital bone.

branous capsule, which has been already described as thrown round the brain, and capable of enlarging with it. This is speedily followed by the deposition of ossific matter at various points of the capsule, which soon becomes converted into flakes of bone, which afford protection for the brain, while the intervening portions, which remain membranous, permit the skull to expand as its contents enlarge. The formation of these bony flakes on the convexity of the cranium is soon followed by the appearance of osseous nuclei in the cartilage at the base, corresponding to the future occipital and sphenoid bones. Lastly, the various bones, some originating in membrane, and some in cartilage (as described in the article OSSIFICATION), approach one another by gradual enlargement, and become united in various ways, so as to form a continuous, and ultimately an unyielding bony case, which, in the words of Dr. Humphrey, "is admirably adapted for the defense of the brain, for the accommodation of the organs of special sense, and for the attachment of the ligaments and muscles by which the skull is supported and moved on the spine."—*The Human Skeleton*, p. 185. At the period of birth most of the principal bones have grown into apposition with their neighbors, forming the *sutures* (q.v.), but one large vacuity remains at the meeting-point of the parietal and frontal bones, which is termed the anterior fontanelle,* which does not close till the second year after birth, and sometimes remains open much longer. The deficiency of the osseous brain-case at this position not only facilitates the act of delivery, but also acts, according to Humphry, to some extent like a safety-valve during the first months of infantile life, at which time the brain bears an unusually large proportion to the rest of

* So called from the pulsations of the brain, which may be here seen, resembling the rising of water at a spring or fountain. There are two fontanelles in the mesial line, as shown in Fig 2, and two lateral fontanelles on either side.

the body, and is liable to sudden variations of size from temporary congestion, sudden wasting of its substance, and other causes. The sutures remain distinct long after the closure of the fontanelles, and probably serve a purpose both in permitting an increase of the size of the cranium by the growth of the bones at their edges (although the enlargement of the cranial cavity does not entirely depend upon this growth at the edges), and in diminishing and dispersing vibrations from blows, and thus contributing to the security of the brain.

The number of centers of ossification in the skull is tolerably constant; each bone having a certain number. (Thus the occipital has 7 centers, the temporal 5, the sphenoid 12, etc.; the total number being about 59). In addition to these, centers frequently occur in the course of the sutures, giving rise to independent pieces, which are called the *ossæ triquetra*, or the *Wormian bones*. They are regarded by Humphry as stop-gaps, developed in the membranous covering of the brain, when the extension of the regular osseous nuclei is likely, for some reason, to be insufficient to cover in the cranial cavity; and this view is supported by the observation that, in cases of rickets and hydrocephalus, the Wormian bones are especially abundant.

After the sutures have been formed, and the skull has acquired a certain thickness, a process of resorption commences in the interior of the bones, and reduces the originally dense structure to a more or less cellular or cancellated state. The interior thus altered is called the *diploe*, and by this change the weight of the skull is much diminished, while its strength is scarcely affected.

The diploe usually begins to be apparent about the tenth year, and is most developed in those skulls which are thickest. Dr. Humphry has observed it to be especially thick in idiots, and where the brain is small. "Hence," he observes, "the propriety of the term *thick-headed*, as a synonym for *stupid*, derives some confirmation from anatomy." A continuation of the same process of resorption, which causes the diploe, gives rise to the formation of the cavities known as the frontal and sphenoid sinuses. The formation of the diploe divides the walls of the cranium into three layers, viz., an outer tough layer; an inner dense, brittle, and somewhat glass-like layer, known as the vitreous table or layer; and the intervening cancellous diploe. The vitreous table being more brittle than the outer layer, is apt to be fissured to a greater extent in fracture of the skull; and is even sometimes broken while the outer layer, which received the blow, has remained entire; although the diploe must have great power in lessening the concussions transmitted from the outer to the inner layer of the skull. The growth of the skull after the seventh year proceeds slowly, but a slight increase goes on to about the age of twenty. The skull-bones are freely supplied with blood from arteries which pass from the dura mater internally and the pericranium externally, through the numerous foramina observed on both surfaces; the blood being returned by veins which take various directions.

The fact that concussion of the brain scarcely ever proves fatal, unless there is also fracture of the skull, affords the most distinct evidence that the skull is constructed in such a manner that so long as it maintains its integrity, it is able to protect its contents from serious lesion. This marvelous protective power is due to its rounded shape whereby its strength is increased, and in consequence of which blows tend to glide off it, without doing material damage. Moreover, the curved lines or ridges which may be traced round the skull tend to strengthen it. The weakest part of the skull is at the base. Hence, notwithstanding its removal from exposure to direct injury and the protection afforded by the soft parts, fracture takes place more frequently at the base than at any other part of the skull, fracture often taking place here even when the skull was not broken at the part struck. There are two points in the architecture of the bones of the face which deserve especial notice, viz., (1) the great strength of the nasal arch, and (2) the immobility of the upper jaw, which is fixed by three buttresses, the nasal, the zygomatic, and the pterygoid.

The base of the skull, whether seen from within or from below, presents many objects of physiological interest in relation to the nervous system. As seen from within, the base presents on each side three fossæ, corresponding to the anterior and middle lobes of the cerebrum and to the cerebellum. These fossæ are marked, as is the whole skull-cap, by the cerebral convolutions, and they contain numerous "foramina" and "fissures" which give passage to various sets of nerves and blood-vessels. The external or outer surface of the base of the skull, if we consider it from before backward, is formed by the palate processes of the superior maxillary and palate bones; the vomer; the pterygoid and spinous processes of the sphenoid and part of its body; the under surface of the temporal bones, and by the occipital bone. The hard palate is formed by the palate processes of the superior maxillary bone.

The anterior region of the skull, which forms the face, is of an irregularly oval form, and the bones are so arranged as to inclose the cavities for the eyes, the nose, and the mouth, and to give strength to the apparatus for masticating the food. The size of the face and the capacity of the cranial cavity stand in an inverse ratio to one another, as may be readily seen by comparing vertical sections (through the mesial line) of human and other mammalian skulls; and if, in place of mammalian skulls, we take skulls of lower vertebrates (the crocodile, for example), this ratio is far more striking. In man the face is at its *minimum* as compared with the cranial cavity, chiefly in consequence

of the facial bones being arranged in a nearly vertical manner beneath the cranium, instead of projecting in front of it. The human face is also remarkable for its relatively great breadth, which allows the orbits for the reception of the eyes to be placed in front instead of on the sides of the head, and renders their inner walls nearly parallel. "This parallelism," says Dr. Humphry, "in man is associated with the parallelism of the optic axes, and contributes to that clear, accurate, and steady vision which results from the ready convergence of the eyes upon every object." Each orbit is of a pyramidal form, with the apex behind, and is composed of seven bones—viz., the frontal, ethmoid, lachrymal, sphenoid, superior maxillary, malar, and palate, which last contributes very slightly to the human orbit, but is an important constituent in the orbit of many animals. The nasal cavities have been sufficiently described in the article NOSE.

The different varieties of mankind present certain well-marked and characteristic peculiarities in the form of the skull. There are *three typical forms* of the skull which seem to be well established from the examination and comparison of a large number of crania—viz., the *prognathous*, the *pyramidal*, and the *oval or elliptical* cranium. When the upper jaw slopes forward, the insertion of the teeth, instead of being perpendicular, is oblique. A skull with this peculiarity is *prognathous* or *prognathic* (Gr. *pro*, forward, and *gnathos*, a jaw); the opposite condition being termed *orthognathous* or *orthognathic* (Gr. *orthos*, upright). The negro of the Guinea coast and the negrito of Australia present the prognathous character in its most marked form. The pyramidal form is characterized by the breadth and flatness of the face, which, with the narrowness of the forehead, gives this shape to the head. The Mongolian and Esquimaux skulls belong to this type. The oval or elliptical type is that which is presented by the natives of western or southern Europe, and which is not distinguished by any particular feature so much as by the absence of the longitudinal projection of the first type, or the lateral projection of the second, and by a general symmetry of the whole configuration. The length of the skull, which to a great degree corresponds to the degree of development of the posterior cerebral lobes, has been taken by the late prof. Retzius as a basis of classification. He arranges all the varieties of mankind into two great classes—the *dolicocephala*, or *long-heads*, whose cerebral lobes completely cover the cerebellum; and the *brachycephala*, or *short-heads*, in whom the cerebral lobes do not extend so far. Each of these classes contains *orthognathous* and *prognathous* varieties. See ETHNOLOGY.

The *Morphology of the Skull* is the highest and most difficult problem of comparative anatomy. Huxley destroyed the archetypal theory, previously held by Owen and others, and established the newer theory on sure grounds of actual observation. Taking first the unsegmented cranium of a skate or dog-fish, with its appended jaws and arches, we find that in development, though the notochord extends into the region of the head, the vertebræ stop short of it; but that on each side of the cranium there arise a pair of cartilaginous bars the *trabeculae* or "rafters" of the future skull, three pairs of cartilaginous capsules, nasal, ocular, and auditory, form round the developing sense organs; the nasal capsules unite with the ends of the trabeculae, which are meanwhile uniting below, and growing up at the sides to form the brain-case. The auditory capsules become united with the trabeculae by the appearance of two new masses of cartilage, the *parachordals*. The first pair of a series of seven or more arches develops an ascending process, becoming the "palato-ptyergoid" arch or upper jaw. The second pair of arches, the hyoid, is modified to support the jaws, while the rest are modified to support the gills. In the bony skulls of higher vertebrates the chondro-cranium and subjacent arches develop in the same way. The bones originate in two distinct ways: either by actual ossifications, or by the ossification of overlying dermis, known as cartilage bones and membrane bones respectively, the latter corresponding to the dermal bones and teeth of ganoid and elasmobranch fishes. In mammals, the ends of the mandibular and hyoid arches lose their suspensory function, are taken into the interior of the ear capsule, and are metamorphosed into the auditory ossicles. See references under SKELETON.

Fracture of the skull is an accident of such importance as to demand a special paragraph. As already remarked, fracture may take place either in the vault or at the base of the skull. We shall first consider *fractures of the vault*. Here the fracture is usually direct, the bone giving way at the point at which it was struck, and the result being either a simple fissure or a breaking of the bone into several fragments (a comminuted fracture). Although fractures may be limited to the outer or to the inner surface of the skull, they most commonly extend through the whole thickness, and the broken bone is generally driven inward; and the most ordinary form of fracture with depression is that in which several fragments of a somewhat triangular form have their points driven down and wedged into each other, while their bases remain on a level with the surrounding bone. There are no signs by which we can in all cases recognize the existence of fracture of the vault. "Fissures," says Mr. Prescott Hewett, "involving the whole thickness of the vault of the skull, constantly exist without ever having been suspected during life; and even an extensive and comminuted fracture, with great depression of the fragments, may, and often does, escape notice when the broken bone lies hidden under the temporal muscle or under a large extravasation of blood."—Holmes's *System of Surgery*, vol. ii. p. 116. When, however, the fracture is accompanied by a wound leading down to the bone it may, in general, be easily detected. With regard

to treatment, it is now an established rule that simple fractures of the skull with depression, and without symptoms, are to be let alone. The depression may be so marked as to be easily detected; and yet so long as there are no symptoms all operative interference, of whatsoever form, is carefully to be avoided."—Prescott Hewett, *op. cit.* If, however, there be a wound leading down to the bone in a depressed fracture without symptoms, immediate operative interference is called for. When a depressed fracture is accompanied by primary brain-symptoms, an operation for the purpose of raising or removing the depressed fragments is usually necessary. If, however, the fracture is a simple one, and the symptoms are not urgent, milder remedial agents, as bleeding, purging, and low diet may be first tried. Cases occasionally occur in which very urgent symptoms of cerebral pressure persist for a long time, and are relieved at once on the pressure being removed. A remarkable case is recorded by Cline (*Medico-Chir. Rev.*, vol. i. p. 471), in which a sailor remained in a state of unconsciousness for 13 months in consequence of a wound causing fracture and depression of one of the parietal bones. Cline trepanned the part and elevated the bone, and on the evening of the same day, the sailor sat up in bed, and though at first stupid and incoherent, soon became rational and well, upward of a year having elapsed in which his life was a complete blank.

Fractures of the base may be direct or indirect, but in most cases are indirect, that is to say, the bones give way at a point remote from the seat of the blow, as has been already shown. At certain parts, however, the bones of the base are so thin that if direct pressure be brought to bear upon them they readily give way. Thus scissors, slate-pencils, tobacco-pipes, etc., have often been thrust into the skull through the orbits or the nostrils, and these wounds are very serious, from the readiness with which the brain may be thus injured. The only symptoms that can be depended upon as indicating a fracture of the base of the skull are connected either with an escape of the substance of the brain, or blood, or watery fluid, or with an injury done to the nerves as they emerge at the base. Out of 32 cases of fractured base observed by Hewett, bleeding from the mouth or nose occurred in 14 and bleeding from the ear in 15 cases. A copious watery discharge from the ear was, until very recently, regarded as a diagnostic sign of fracture of the base; and there can be no doubt that when such a discharge of cerebro-spinal fluid occurs either from the ear or nostrils, that it *most probably* is connected with fracture. Operative interference is very seldom required in these fractures, our treatment being directed not against the broken bones, but against the accompanying cerebral lesions.

SKULLCAP, a genus (*scutellaria*) of herbs of the mint family (*labiate*). The generic characters are: calyx bell-shaped when in flower, two-lipped, the upper lip with a helmet-like appendage; calyx splitting at the base at maturity, the upper lip usually falling away; corolla having an elongated curved ascending tube, dilated at the throat, two-lipped; stamens four; anthers approximate in pairs and bearded. The following species grow in the United States: *S. versicolor*, from 1 to 3 ft. high, stem erect, leaves heart-shaped; river banks from Pennsylvania to Wisconsin and southward: *S. saxatilis*; stem weak, from 6 to 18 in., sometimes having runners; leaves heart-shaped, crenate, from 1 to 2 in. long; growing on moist shady banks in southern Ohio, Virginia, and Kentucky, and on mountains farther south: *S. canescens*; 2 to 4 ft. high, stem-branched above, with panicle, many-flowered racemes; lance-ovate, crenate leaves, whitish, with fine soft down; upper lip of corolla shorter than lower; rich soil from Pennsylvania to Illinois and southward: *S. serrata*; stem from 1 to 3 ft. high, simple, with single, loosely flowered racemes; leaves ovate, serrate, and acuminate at both ends; corolla one inch long, lips equal; growing in woods from Pennsylvania to Illinois and southward: *S. pilosa*; stem simple, 1 to 3 ft. high; leaves oblong-ovate, crenate; racemes short; corolla rather narrow; growing on dry ground in southern New York to Michigan and southward: *S. lateriflora* is a species which has been used as a quack medicine in hydrophobia, and bears the common name of mad-dog skullcap. It has a smooth, upright stem, much branched; 1 to 2 ft. high; leaves lanceolate-ovate, coarsely serrate; growing in wet, shady places in many parts of the United States. Other species are *S. integrifolia*, *S. nervosa*, *S. parvula*, and *S. galeiculata*.

SKUNK, *Mephitis*, a genus of quadrupeds of the weasel family (*mustelidae*), but departing very considerably from the typical characters of that family, and approaching to the badgers and gluttons in general appearance, in habits, in the lengthened claws of the fore-feet, in the plantigrade hind-feet, and in some of the teeth. There are six incisors and two canine teeth in each jaw, eight molars in the upper, and ten in the lower; the teeth generally resemble those of the polecat. Skunks depend very much for defense against enemies on an excessively fetid fluid, which is secreted by glands near the anus; and when assailed, they turn the rump toward the assailant, elevate the tail, and discharge this fluid with considerable force. The odor proceeding from it, even when a dead skunk has been flung into an inclosure, has been known to cause nausea to the inmates of an apartment with closed windows at the distance of 100 yards. So confident does the skunk seem of the efficacy of its peculiar mode of defense, that it permits itself to be approached till it is just on the point of being seized, which, however, is only attempted by the inexperienced, when the battery is discharged. It is almost impossible to remove the odor from clothes. Dogs flee at once, and rub their

noses on the ground till they bleed. Dogs that are aware of the skunk's powers, however, kill it by leaping upon it suddenly, and in such a way that they are not exposed to danger. There is much uncertainty concerning the species of skunk, as the colors vary considerably even in the same species; but there is no doubt of the existence of a number of species. They are found only in America, where they are very widely distributed from Hudson's Bay to the Strait of Magellan. The COMMON SKUNK (*M. Americana* or *varians*) is about the size of a cat, generally black or blackish brown, with white streaks along the back. It inhabits burrows which it makes in the earth, feeds on mice, frogs, etc., and also on insects and fruits; and sometimes enters houses to plunder store-rooms, where, if it is suddenly alarmed, everything is tainted with an intolerable odor. White streaks on the back, one or more, are very characteristic of this genus.

SKUNK CABBAGE, sometimes called dracontium, and by the Germans, *stinkende drachenwurz*. It is the *symplocarpus foetidus*, a plant belonging to the arum family, growing in bogs and moist ground in many parts of North America. It blossoms in April and May. The spathe, which precedes the leaves, is hooded, shell form, pointed, rather fleshy, of a variegated purplish brown and yellow color, inclosing a short oval spadix, which is densely tessellated with fleshy flowers, and enlarges to a spongy mass, which superficially covers the globular seeds. The leaves are radical, 18 to 24 in. long, on short leaf-stalks, smooth, ovate, heart-shaped. All parts of the plant emit a fetid odor, especially when bruised, which has some resemblance to the fetid secretion of the skunk. The fruit is ripe in September, forming a roughened, globular mass 2 or 3 in. in diameter, containing many round seeds nearly half an inch in diameter, filled with a solid fleshy embryo. Skunk cabbage, or dracontium, taken internally produces vertigo, nausea, and frequently vomiting. It has been used in hysteria, chorea, and spasmodic asthma, but it is probably much less efficient than many other medicines, and is not often used by the profession. The root is the part used, and should be collected early in the spring.

SKUPTSCHINA (more freely, *Narodna Skuptschina*, "National Assembly"). The name given in Serbia to the national parliament. See **POLITICAL PARTIES, SERBIAN**.

SKYE (Gaelic *skianach*, winged), the largest of the Scottish islands after Lewis, and the most northerly of the group known as the inner Hebrides, forms part of the county of Inverness, from the mainland of which it is separated by a channel scarcely half a mile in breadth at its narrowest point, Kyle Rhea. Its extreme length, from s.e. to n.w., is 47 m.; breadth, from 7 to 25 m.; but on account of the extraordinary number of inlets at all parts of the island, no point is above 4 m. from the sea. Area, 535 sq.m.; pop. '91, 15,705. Skye is for the most part mountainous and moory, but it contains some pleasant tracts of arable and pasture land, and one considerable plain, formerly the bed of a lake, in the parish of Kilmuir. The principal mountains are the Coolin Hills, which stretch irregularly chiefly from s.w. to n.e., culminating in the sharp peak of Scoor-nan-Gillea (3,167 ft.) above Sligachan. Another peak, Scoor Dearg, has been found to be the highest of the range (3,233 feet). The singularly jagged outline of these remarkable hills is a well-known landmark to mariners far out at sea. The most famous scene in this region is loch Coiruisg, a small fresh-water lake near the head of the bay of Scavaig, all but encircled by frowning ridges of rock, shooting up at some points to the height of 3,000 feet. It has been powerfully depicted by sir W. Scott in *The Lord of the Isles*. Glen Sligachan, extending from the head of the loch of that name about 9 m. to Caumsunary, is considered the grandest glen in the highlands. The scenery of Cuiraing, near the n. of the island, has been truly styled "unique." The coast-scenery of Skye is for the most part highly picturesque, and in many places very grand. Between Rhu-nam-Brarin and loch Staffin, the coast-line presents magnificent basaltic formations, on a scale of magnitude considerably exceeding the giants' causeway or Staffa. Over these cliffs descend many remarkable waterfalls, and their bases are frequently worn into deep caves, some of which are of historical interest. One near Portree afforded a refuge to prince Charles; another, on the w. coast, was the temporary prison of lady Grange. The largest arms of the sea are loch Bracadale, loch Dunvegan, and loch Snizort; and the chief harbors are those of Portree, Uig, Grishinish, Lochbay, Dunvegan, Pooltiel, and Harport.

The coasts abound in fish, the most important being herring, cod, ling, and saithe. Good oysters are found in several places. The herring fishery is prosecuted in the season in all the bays: the cod and ling fishery is chiefly confined to loch Dunvegan and loch Snizort; and the salmon fishery to Portree and the e. coast. Lobster-fishing is also carried on to a considerable extent. There are no rivers of any magnitude; but salmon and sea-trout are got in some of the principal streams, at Skeabost, Portree, Ose, Hammer, &c. The fresh-water lakes are also small, and few in number. Deer are not numerous, nor are grouse. An excellent breed of hardy ponies used to be extensively reared, but the cultivation of sheep now engrosses almost exclusive attention from farmers. The climate of Skye is exceedingly moist, the days throughout the year during which no rain falls being generally few in number. The mean annual rainfall is 81.75 in. The climate is, however, mild and healthy, and the average standard of longevity uncommonly high.

The inhabitants are for the most part poor. In the districts where the men practice fishing, nearly the whole of the adult males go to the Caithness fisheries in summer, while from all parts of the island young men and women go in troops to the s. in search of field-labor. Potatoes and fish are the general diet, meat being a rare luxury. The population is chiefly Celtic, with, however, a considerable mixture of the Norse element. Gaelic is still universally spoken, but is gradually giving place to English. The chief proprietors are still, as of old, lord Macdonald, whose seat, Armadale castle in Sleat, is one of the most beautiful in all its surroundings to be seen on the Scottish coasts, and Macleod of Macleod, whose ancient castle of Dunvegan, picturesquely seated on a rock, has been pleasantly commemorated by Dr. Johnson and sir Walter Scott. Around these residences are the principal plantations to be seen in Skye. The principal port of Skye is Portree, a picturesquely situated village, to which steamers regularly ply from Glasgow. Other villages, also calling-points of the steamers, are Kyleakin (Hakon's strait), Broadford, and Dunvegan. The principal exports are cattle and sheep, wool, fish, shell-fish, and eggs. At Portree there is a flourishing tweed manufactory, the only one in the island. The celebrated whiskey known as "Talisker" is manufactured at Carabost. The inhabitants are, with the exception of a few families, all Presbyterians, and, as in the rest of the highlands, chiefly adherents of the free church. Of the smaller islands near Skye, the chief are Raasay, Ronay, Scalpay, Pabbay, Soay, all of which are inhabited. See Boswell's *Tour in the Hebrides*; Smith's *Summer in Skye*.

SKYRO, or **SCYRO**, an island of the Grecian archipelago, the largest member of the northern Sporades, 25 m. e. of cape Koumi, Eubœa. Its length is 19 m.; area estimated at about 60 sq. miles. Skyros is very mountainous and uncultivated in the s., but the northern part, though also hilly, has several fertile plains, which produce as fine wheat as any grown in the archipelago. The only town in the island is Skyro, or St. George, which is built on a high peak on the eastern coast, the broad summit of which is occupied by the ruins of a castle, and was the site of "the lofty Seyros" of Homer. There are several relics of antiquity on the island. Pop. '89, 3188.

SLAGS, called otherwise scorïæ or cinders, are fused compounds of silica in combination with lime, alumina, or other bases; and result as secondary products from the reduction of metallic ores. More or less of the metal always remains in a slag; in the early days of iron-smelting, the proportion of metal thus wasted was so great that some old slags have been profitably smelted in recent times. Slags being silicates, are of the nature of glass, and externally have a glassy, crystallized, or stone-like character. Beautifully crystallized specimens are occasionally to be met with at smelting-works. They vary very much in color, and are sometimes so prettily veined and marbled, that attempts have been made to apply them to ornamental purposes. Millions of tons of slag are annually produced at the iron-smelting works of Great Britain, but almost the only use to which it has yet been successfully applied is in the making of square blocks or bricks for building purposes. The slag is run into molds, either as it issues from the blast-furnace, or after being remelted; and it is found to be a very durable material. Broken slag is also used as a covering for roads, but its brittleness and sharpness are objectionable qualities for this purpose. Several patents, beginning so far back as 1728, have been taken out for casting slag into articles of a more ornamental kind, but hitherto they have not been commercially successful.

In an archæological point of view, slags are interesting as pointing out the sites of ancient smelting-works, and as affording a clue to the primitive methods of obtaining the metals from their ores.

SLANDER is an injury to a person's character and reputation caused by spoken words. It is difficult to define what kind of injuries of this nature are actionable, but in general whatever imputes disgraceful, fraudulent, or dishonest conduct, or even tends to make a man contemptible in his private relations, and shunned by his friends and neighbors, is a slander. Thus, whatever imputes a crime, or indictable offense, or a contagious disease, is a slander. There are some epithets, however, which are not actionable unless some special damage is directly caused thereby, as calling a man a scoundrel, swindler, rogue, gambler, liar, etc. To call a woman a whore is also not actionable, unless she can show that she has lost offers of marriage, etc., thereby. Words imputing gross ignorance or misconduct affecting one's trade or profession are, however, actionable, as calling a man a bankrupt grocer, a quack doctor, etc. See also **LIBEL**. The remedy for slander is an action at law for damages. Though certain words when spoken will not amount to slander, yet, if printed or written, they will sometimes become so, as calling one a rogue, swindler, rascal, etc.

Words that are properly actionable in themselves, without proof of special damage, must "impute," according to Heard, *Libel and Slander*, § 24, "the commission of a crime involving moral turpitude, and which is punishable by law." Words spoken of one in office and tending to cause the loss of that office, or words imputing want of ability or capacity in business, or words imputing to a man a disease or distemper which renders him unfit for society, are likewise actionable without proof of special damage. In the case of words not actionable in themselves, special damage must be specified in the declaration. To make words actionable they must be uttered without legal cause. But some communications are privileged. The slander must be com-

municated to a third person. Malice is essential, but will be inferred in the absence of evidence to the contrary. The falsity of the charge will be inferred till the contrary is shown. A repetition of oral slander, already in circulation, without any expression of an opinion as to its truth, is actionable.

SLANG, once assumed to have been borrowed from the gypsy tongue, but derived by Skeat from a Scandinavian source. In its usual signification it denotes a burlesque style of conversational language, originally found only among the vulgar, but now more or less in use in this country among persons in a variety of walks in life. It is somewhat allied to, though not identical with, *cant* (in French *argot*), the language used for purposes of concealment by thieves and vagrants of all descriptions.

Slang is not exclusively of modern date. It was known in the classic ages of Greece and Rome, and abounds in the writings of Aristophanes, Plautus, Terence, and Martial. Every modern European language has its slang. In England, the "rump," and the "barebones parliament," the terms "Roundheads," "Puritans," "Quakers," all belonged to the slang of the 17th century. *Hudibras* and the dramatic works of last century abound in slang. Old English slang was coarser than that now in use, but the greater portion of its phraseology had a somewhat restricted circulation, not permeating every species of conversation to the extent that modern slang does. Toward the close of last century the slang vocabulary received large additions from pugilism, racing, and "fast life;" and its fashionable vulgarisms came into great favor during the minority of the prince regent. In the present century the growth of refinement in manners and ideas has not banished slang, but given it a more familiar and utilitarian character, while it has been introduced in some measure into circles where it was formerly unknown.

Slang consists in part of new words, and in part of words of the legitimate language invested with new meanings, such as are assigned to the verbs to *cut*, to *do*. Many slang expressions are derived from thieves' cant, and some from the gypsy tongue. Their derivations are often indirect, arising out of fanciful allusions and metaphors, which soon pass out of the public mind, the word remaining, while its origin is forgotten. The origin of much of the current slang may be traced to the universities of Oxford and Cambridge, and the great public schools of England. There is not an institution connected with the university which has not its slang equivalent (e.g., "plucked," "little go").

There is a slang attached to various professions, occupations, and classes of society. The slang of English fashionable life and fashionable novels comprises a number of French words and phrases, whose application is often very different from what is current in France. The *beau monde*, a *chaperon*, a marriage being on the *tapis*, are expressions which, in their English sense, are utterly unknown in Paris. To the slang of military life Hindustani has contributed its quota of words, imported by officers who have resided long in India. There is also parliamentary slang, religious slang, literary slang, civic slang, and shopkeepers' slang.—Many curious details regarding slang in all its departments are to be found in Hotten's *Slang Dictionary* (Lond., 2d ed., 1885).

SLATE, or **CLAY-SLATE** (Fr. *eschat*, a shiver or splinter), is a highly metamorphosed argillaceous rock, fine-grained and fissile, and of a dull blue, gray, green, or black color. It splits into thin laminae or plates, that are altogether independent of the layers of deposit; though sometimes coinciding with them, they more frequently cross them at different angles. See **CLEAVAGE**. Some rocks that split into the thin plates of the original stratification are popularly but erroneously named slate, as the thin bedded sandstones properly called flagstones or tilestones, the fissile shales of Cambrian and Silurian age, and the metamorphic, gneiss, and mica schist, whose planes of division correspond to their stratification. True slate is a very compact rock, little liable to be acted upon by atmospheric agencies. It is chiefly obtained from paleozoic strata, but it is found also among more recent rocks. It is used for various purposes, being split into thin slabs of small size for the roofing of houses, and into larger slabs for fitting up dairies, etc., and even for making billiard-tables, and split and polished by means of pumice for writing-slates.

In roofing with slates it is necessary to put on the slates in two thicknesses, so that the sloping joints may be covered by the overlap of the course above. Besides this, the third course must also cover the first by an inch or two, to prevent rain from penetrating. Slates are generally laid upon boarding, and bedded in lime, and nailed with malleable-iron nails, japanned, so as to prevent them from rusting. When large strong slates are used, they may be nailed to strong laths in place of boarding.

SLATE-PENCILS are either cut or turned sticks of slate, or they are made by pressing moistened slate-powder until it is firm enough to be made into pencils.

SLATER, JOHN FOX, 1815-84; b. R. I.; d. Norwich, Conn.; was the son of John Slater, who, with his brother Samuel, founded the cotton manufacturing industry in the U. S. He became interested with his father in the cotton business and inherited from him a mill at Jewett City, Conn. With this as a nucleus he amassed a large fortune, and won national distinction by his gift, 1882, of \$1,000,000, which he placed under an admirable plan of administration for the education of the freedmen of the South, known as the Slater fund. Besides his large interests in cotton manufacture, he was prominently connected with various banking and railroad enterprises.

SLATER, SAMUEL, 1768-1835; b. England; apprenticed in 1782 to Strutt, Arkwright's partner in cotton spinning, and learned the business. Having heard of a United States law to promote manufactures, and of the bounty offered by the Pennsylvania legislature for the introduction of the Arkwright patents into this country, he came to New York in 1789. Going to Providence at the request of Moses Brown of that place, who had made some experiments in cotton-spinning machinery, he contracted to build and run the machinery required, and in 1790 started a mill at Pawtucket with 72 spindles and 3 carding-machines. The cotton manufacture of this country dates from that time. He afterward built cotton-mills of his own at what is now Webster, Mass., and erected woolen mills at the same place, 1815-16. He thus built up the village of Slatersville, where his descendants still carry on a prosperous business. He was a liberal employer, and established schools for the children of his workmen. He had to rely solely upon his memory to reproduce the Arkwright machinery, the English laws forbidding the exportation of models. For some time he could not recall an important mechanical detail, which finally occurred to him in a dream.

SLAVE-COAST, a division of the coast of Upper Guinea, Africa, lying between the rivers Volta and Lagos. See **GUINEA**.

SLAVERY. A slave is an individual who is the property, or at the disposal of another, who has a right to employ or treat him as he pleases. Such is the state of the slave in the most absolute sense of the term; but slavery has been subjected to innumerable limitations and modifications.

Slavery probably arose at an early period of the world's history out of the accident of capture in war. Savages, in place of massacring their captives, found it more profitable to keep them in servitude. All the ancient oriental nations of whom we have any records, including the Jews, had their slaves. The Hebrews were authorized by their law to possess slaves, not only of other races, but of their own nation. The latter were generally insolvent debtors, who had sold themselves through poverty, or thieves who lacked the means of making restitution; and the law dealt with them far more leniently than with stranger slaves. They might be redeemed; and if not redeemed, became free in the space of seven years from the beginning of their servitude; besides which, there was, every fiftieth year, a general emancipation of native slaves.

Slavery existed in ancient Greece: in the Homeric poems, it is the ordinary destiny of prisoners of war; and the practice of kidnapping slaves is also recognized—Ulysses himself narrowly escaping a fate of this kind. None of the Greek philosophers considered the condition of slavery objectionable on the score of morals. Aristotle defends its justice on the ground of a diversity of race, dividing mankind into the free and the slaves by nature; while Plato only desires that no Greeks should be made slaves. One class of the Greek slaves were the descendants of an earlier and conquered race of inhabitants, who cultivated the land which their masters had appropriated, paid rent for it, and attended their masters in war. Such were the Helots in Sparta, the Penestæ in Thessaly, the Bithynians at Byzantium, etc., who were more favorably dealt with than other slaves, their condition somewhat resembling that of the serfs of the middle ages. They could not be sold out of the country, or separated from their families, and were even capable of acquiring property. Domestic slaves obtained by purchase were the unrestricted property of their owners, who could dispose of them at pleasure. In Athens, Corinth, and the other commercial states, they were very numerous, and mostly barbarians. They were employed partly in domestic service, but more as bakers, cooks, tailors, or in other trades, and in mines and manufactories; and their labor was the means by which the owner obtained profit for his outlay in their purchase. These slaves were, for the most part, purchased; but few were born in their master's family, partly from the general discouragement of the cohabitation of slaves, and partly from the small number of the female in comparison with the male slaves. An extensive traffic in slaves was carried on by the Greek colonists in Asia Minor with the interior of Asia; and another source of supply arose from the practice common among Thracian parents of selling their children. In Greece in general, and especially at Athens, slaves were mildly treated, and enjoyed a large share of legal protection. According to Demosthenes, a slave at Athens was better off than a free citizen in many other countries.

The Roman condition of slavery differed in some particulars from that of Greece. All men were considered by the Roman jurists to be free by natural law; while slavery was regarded as a state contrary to natural law, but agreeable to the law of nations, when a captive was preserved, instead of being slain (hence the name *servus*, quasi, *servatus*); or agreeable to the civil law, when a free man sold himself. In earlier times, there was no restriction on the master's power of punishing or putting to death his slave; and even at a later period, when the law on this head was much modified, slaves were used with considerable rigor. The estimation in which their lives were held is illustrated by the practice of gladiatorial combats, as also by the conduct of Vedius Pollio, who, in the polite age of Augustus, flung such slaves as displeased him into his fish-ponds, to feed his lampreys, and on the matter being brought under the emperor's notice, was visited with no severer punishment than the destruction of his ponds. Old and useless slaves were often exposed to starve in an island of the Tiber. Under the empire, the cruelty of masters was in some degree restrained by law. It was enacted, that a man who put

to death his own slave without cause should be dealt with as if the slave had been the property of another; and that if the cruelty of the master was intolerable, he might be compelled to sell the slave. A constitution of Claudius declared the killing of a slave to be murder, and it was also enacted, that in sales of slaves, parents and children, brothers and sisters, should not be separated. A slave could not contract marriage, and no legal relation between him and his children was recognized. The children of a female slave followed the status of their mother. There was various ways in which a slave might be manumitted, but the power of manumission was restricted by law. The harboring of a runaway slave was illegal. The number of slaves in Rome, originally small, was increased much by war and commerce; and the cultivation of the soil came, in the course of time, to be entirely given up to them. During the later republic and empire, persons in good circumstances kept an immense number of slaves as personal attendants; and the possession of a numerous retinue of domestic slaves was matter of ostentation—200 being no uncommon number for one person. A multitude of slaves were also occupied in the mechanical arts and the games of the amphitheater. Originally, a slave was incapable of acquiring property, all his acquisitions belonging to his master; but when slaves came to be employed in trade, this condition was mitigated, and it became the practice to allow a slave to consider part of his gains, called his *peculium*, as his own, a stipulation being sometimes made that he should purchase his freedom with his *peculium*, when it amounted to a specific sum.

Though the introduction of Christianity did not do away with slavery, it tended to ameliorate the condition of the slave. Justinian did much to promote the eventual extinction of slavery; and the church excommunicated slave-owners who put their slaves to death without warrant from the judge. But the number of slaves again increased; multitudes being brought with them by the barbarian invaders, who were mostly Slavonian captives (whence our word *slave*); and in the countries which had been provinces of the empire, slavery continued long after the empire had fallen to pieces, and eventually merged into the mitigated condition known as serfdom, which prevailed all over Europe in the middle ages, and has been gradually abolished in modern times. See SERF. But though the practice of selling captives taken in war as slaves ceased in the Christian countries of Europe, a large traffic in slaves continued among Mohammedan nations, by whom Christian captives were sold in Asia and Africa; and in the early middle ages the Venetian merchants traded largely in slaves, whom they purchased on the coast of Slavonia, to supply the slave-markets of the Saracens.

The negro slavery of modern times was a sequel to the discovery of America. Prior, however, to that event, the negroes, like other savage races, enslaved those captives in war whom they did not put to death, and a considerable trade in slaves from the coast of Guinea was carried on by the Arabs. The deportation of the Africans to the plantations and mines of the New World doubtless raised the value of the captive negro, and made slavery rather than death his common fate; while it may also have tempted the petty princes to make war on each other, for the purpose of acquiring captives, and selling them. The aborigines of America having proved too weak for the work required of them, the Portuguese, who possessed a large part of the African coast, began the importation of negroes, in which they were followed by the other colonizers of the New World. The first part of the New World in which negroes were extensively used was Hayti, in St. Domingo. The aboriginal population had at first been employed in the mines; but this sort of labor was found so fatal to their constitutions that Las Casas, bishop of Chiapa, the celebrated protector of the Indians, interceded with Charles for the substitution of African slaves as a stronger race; the emperor accordingly, in 1517, authorized a large importation of negroes from the establishments of the Portuguese on the coast of Guinea. Sir John Hawkins was the first Englishman who engaged in the traffic, in which his countrymen soon largely participated, England having exported no fewer than 300,000 slaves from Africa between the years 1680 and 1700, and between 1700 and 1786, imported 610,000 into Jamaica alone. The slave-trade was attended with extreme inhumanity; the ships which transported the negroes from Africa to America were over-crowded to such an extent that a large proportion died in the passage; and the treatment of the slave after his arrival in the New World depended much on the character of his master. Legal restraints were, however, imposed in the various European settlements, to protect the slaves from injury; in the British colonies, courts were instituted to hear their complaints; their condition was to a certain extent ameliorated, and the flogging of women was prohibited. But while slavery was thus legalized in the British colonies, it was at the same time the law of England (as decided in 1772 in the case of the negro Somerset), that as soon as a slave set his foot on English soil he became free; though, if he returned to his master's country, he could be reclaimed.

Before the idea of emancipation was contemplated, the efforts of the more humane portion of the public were directed toward the abolition of the traffic in slaves. In 1787 a society for the suppression of the slave-trade was formed in London, numbering Messrs. W. Dellwyn, Thomas Clarkson, and Granville Sharp among its original members. The most active parliamentary leader in the cause was Mr. William Wilberforce, whose views were seconded by Mr. Pitt. In February, 1788, an order of the crown directed that an inquiry should be made by a committee of the privy-council into the state of the slave-trade; and an act was passed to regulate the burden of slave-ships, and otherwise dimin-

ish the horrors of the middle-passage. A bill introduced by Mr. Wilberforce for putting an end to the further importation of slaves was lost in 1791. Meanwhile, the conquest of the Dutch colonies having led to a great increase in the British slave-trade, an order in council in 1805 prohibited that traffic in the conquered colonies; and in the following year, an act was passed forbidding British subjects to take part in it, either for the supply of the conquered colonies or of foreign possessions. In the same year, a resolution moved by Mr. Fox for a total abolition next session, was carried in the commons, and on lord Granville's motion, adopted in the lords; and the following year, the general abolition bill, making all slave-trade illegal after Jan. 1, 1808, was introduced by lord Howick (afterward earl Grey) in the house of commons, was carried in both houses, and received the royal assent on Mar. 25, 1807. British subjects, however, continued to carry on the trade under cover of the Spanish and Portuguese flags; the slave-ships were more crowded than ever, from the necessity of avoiding capture, and the negroes were not unfrequently thrown overboard on a pursuit. The pecuniary penalties of the act were discovered to be inadequate to put down a traffic so lucrative as to cover all losses by capture. Mr. Brougham therefore, in 1811, introduced a bill, which was carried unanimously, making the slave-trade felony, punishable with 14 years' transportation, or from three to five years' imprisonment with hard labor. An act of 1824 declared it piracy, and as such, a capital crime, if committed within the admiralty jurisdiction; and the statute of 1837, mitigating the criminal code, left it punishable with transportation for life. Among the philanthropic projects due to the exertions of the anti-slavery society was the establishment of the colony of Sierra Leone, on the coast of Africa, which had been formed by the British government in 1787, in order to show the possibility of obtaining colonial produce without slave-labor, and after the abolition of the slave-trade, became a settlement for the negroes captured by British cruisers.

The United States of America abolished the slave-trade immediately after Great Britain, and the same was in the course of time done by the South American republics of Venezuela, Chili, and Buenos Ayres, by Sweden, Denmark, Holland, and during the hundred days after Napoleon's return from Elba, by France. Great Britain, at the peace, exerted her influence to induce other foreign powers to adopt a similar policy; and eventually nearly all the states of Europe have passed laws or entered into treaties prohibiting the traffic. The accession of Portugal and Spain to the principle of abolition was obtained by treaties of date 1815 and 1817, and by a convention concluded with Brazil in 1826, it was declared piratical for the subjects of that country to be engaged in the slave-trade after 1830. By the conventions with France of 1831 and 1833, to which nearly all the maritime powers of Europe have since acceded, a mutual right of search was stipulated within certain seas, for the purpose of suppressing this traffic. The provisions of these treaties were further extended in 1841 by the quintuple treaty between the five great European powers, subsequently ratified by all of them except France. The Ashburton treaty of 1842 with the United States provided for the maintenance by each country of a squadron on the African coast; and in 1845, a joint co-operation of the naval forces of England and France was substituted for the mutual right of search.

The limitation of the supply of negroes naturally led, among other good results, to a greater attention on the part of the masters to the condition of their slaves. But the attention of British philanthropists was next directed toward doing away with slavery altogether in the colonies. Societies were formed with this end, an agitation was set on foot, and attempts were made, for some time without success, to press the subject of emancipation on the house of commons. At length, in 1833, a ministerial proposition for emancipation was introduced by Mr. Stanley, then colonial secretary, and an emancipation bill passed both houses, and obtained the royal assent, Aug. 28, 1833. This act, while it gave freedom to the slaves throughout all the British colonies, at the same time awarded an indemnification to the slave-owners of £20,000,000. Slavery was to cease on Aug. 1, 1834; but the slaves were for a certain duration of time to be apprenticed laborers to their former owners. Objections being raised to the apprenticeship, its duration was shortened, and the complete enfranchisement took place in 1838.

The French emancipated their negroes in 1848; as did most of the new republics of South America at the time of the revolution; while the Dutch slaves had freedom conferred on them in 1863. In Hayti slavery ceased as far back as 1791, its abolition having been one of the results of the negro insurrection of that year. Slavery still exists in the Spanish and Portuguese colonies, but recent acts have been passed for its abolition. In Brazil a law for the gradual emancipation of slaves was passed in 1871. It enacted that from that date children born of slave women should be free; while, at the same time they were bound to serve the owners of their mothers as apprentices for twenty-one years. A recent treaty between Great Britain and the sultan of Zanzibar secures, in promise, the speedy abolition of the slave-trade on the opposite eastern coast of Africa. The expedition of sir Samuel Baker in 1873 was announced as having put an end to the slave-trade to the s. of Egypt, as far as the equator. How far the khedive was sincere in coupling this object with the conquest of the Nile regions is doubtful; and it is certain that most of his officers, and an army of slave-hunters, are bent on defeating the attempt. In 1874 the British governor at the Gold Coast, where domestic slavery still existed, announced that thenceforth no person could be sold as a slave in the protectorate or removed from it for that purpose.

In presence of the statement in the "Declaration of Independence," that "all men are born free and equal, and possess equal and inalienable rights to life, liberty, and the pursuit of happiness," the colonies which threw off the British yoke numbered several hundred thousand negro slaves, whose condition of slavery was expressly recognized in the constitution of the United States, as ratified in 1788, provision being there made for the rendition of fugitive slaves, a subject the regulation of which was delegated to the federal government, slavery being otherwise left to be governed by the laws of the states where it existed. Slavery established itself firmly in the southern states, where negro labor was required for the cultivation of sugar and cotton; and after the limitation of the supply from Africa, the breeding of slaves went on to a large extent in Maryland and Virginia for the supply of the other states of the south. The different positions of the northern and southern states regarding slavery, combined with other causes to engender that diversity of feeling and interest between north and south out of which arose the civil war. The politicians of the north, however, except a small section, by no means advocated the abolition of slavery where it already existed; they only objected to its extension to new territories. The increased consumption of cotton led to an increased demand for slave-labor; and in 1820, when Missouri was admitted to the union as a slave state, a compromise was entered into by which slavery was legalized to the south, but prohibited to the north of 36° 30' n. lat. (see MASON AND DIXON'S LINE). California, though partly lying s. of that geographical line, was admitted as a free state, the southern party obtaining in compensation the boon of an amendment of the fugitive slave law, making it penal to harbor runaway slaves or aid in their escape. A reaction against the policy of the south, and Mr. Lincoln's election as president, were the signals for a long-contemplated secession of the southern states, and the bloody war which ended in the overthrow of the principle of state-sovereignty and the consolidation of the union. In the course of the war many negroes were emancipated; and on Sept. 22, 1862, Mr. Lincoln issued a proclamation declaring all the negroes of secession masters who should not have returned to the union before Jan. 1, 1863, to be free. In January, 1865, Congress finally voted for an amendment to the constitution, abolishing slavery; and by the end of the year this had been approved by an overwhelming majority of the state legislatures. In the year 1776 there had been about 300,000 Africans imported into the British colonies in America, from the time of their first settlement. The number existing in the United States, according to the first census, 1790, was 697,897; every state in the union contributing except Massachusetts, which at this time included Maine. Ten years later the number had increased to 893,041; and in 1810 to 1,191,364. The succeeding decennial census showed the following figures as the existing number of slaves in the states at the dates mentioned:

1820.....	1,538,022
1830.....	2,009,043
1840.....	2,487,455
1850.....	3,204,313
1860.....	3,953,760

At the period of the organization of the national government the feeling of distaste for the institution of domestic slavery was strong in the southern states themselves, and prevalent throughout the union, though certain ship-owners of Boston and other parts of New-England found it to their interest to foster a state of things which was to them greatly remunerative. They supplied the slave-ships which transported the Africans from the points of departure on the w. coast of Africa, and grew rich on the traffic. But Vermont abolished slavery in 1777; Massachusetts in 1780; and Rhode Island and Connecticut gradually, both these states having a few slaves as late as 1840. New York finally abolished the institution in 1827; having gradually emancipated its slaves since 1799. New Jersey followed the same plan in 1804, and had 236 slaves still living in 1850. Pennsylvania commenced gradual emancipation in 1780, and in 1840 contained 64 slaves. The southern states had from the beginning found slaves more profitable to them than they could have ever possibly been in the north; and this fact alone had been sufficient to occasion the gradual centralization of the institution within the boundaries of those states. But the invention of the cotton-gin in 1793, by Eli Whitney, a Massachusetts man, increased the demand for labor, and specially increased the available uses of slave labor. In 1791 the entire cotton crop of the United States amounted to 2,000,000 pounds. In 1801 the crop was 48,000,000, of which nearly one-half was exported. In 1821 the crop was 180,000,000 pounds; in 1825, 255,000,000; and it continued to increase until, in 1860, it was 2,054,698,800 pounds. In the face of this tremendous accretion of a product representing a vast increase in the wealth of the country and of individuals, the feeble efforts of persons to oppose the continuance of what was esteemed the chief producing force, were of course futile. Washington, Jefferson, Franklin, Hamilton, and others of the leaders of public opinion in the early history of the country, were opposed to slavery on moral and religious grounds; and not less as a system calculated to become a retarding influence as to the progress of civilization and the general advancement of the people. And had not the invention of the cotton gin operated to encourage the perpetuation of the system, the opinions of such men would

have doubtless exercised their due weight in creating a profound and general public sentiment in antagonism to its existence. As it was, the question grew to be considered from this standpoint by humanitarians alone; while, having gradually become absorbed into the general party politics of the country, and connected with important points arising in relation to the accession of new territory, and its political status, its bearing eventually became national, and in a sense vital. The opponents of slavery began as early as 1775, with the formation of the Pennsylvania abolition society, their consistent resistance to the continuance and spread of slavery. By them, and from the period of the establishment of the *Liberator* in Boston, in 1831, under the leadership of William Lloyd Garrison, Wendell Phillips, Arthur Tappan, and other prominent men, a crusade against slavery was undertaken, which never ceased until victory had been achieved, and the last slave was freed. The formation of a political (free-soil) party in 1848 organized the various elements throughout the country which were in agreement on the main question; and candidates for the presidency on the broad platform of freedom for the slave assumed a position in national politics. Compromises began to be the only method for settling, even temporarily, questions whose complete recognition and conclusion seemed dangerous and impracticable in the existing and growing state of excited public feeling. The effort to extend slavery into the newly acquired territories was the rock on which the pro-slavery leaders eventually split; and the outbreak in Kansas, and the Fremont presidential campaign foreshadowed the serious character of the coming struggle. The "underground railroad," as it was called, the secret and persistent method of northern abolitionists to settle the question practically by absorbing the slaves into non-slaveholding communities, roused a bitterness of feeling in the south, which not even supreme court decisions and congressional enactments in favor of the slaveholders could allay. Missouri border ruffianism and "squatter sovereignty" were answered by Sharps's rifles, and at length the raid of John Brown at Harper's Ferry presented the "impending crisis," which the election of Lincoln made positive and present. The old antagonism between Puritan and cavalier; between manufacturing and agricultural interest; between a northern and a southern people, was now laid upon the shoulders of the institution of slavery. And the revolution which had become essential to clear the moral and political atmosphere of the country of all these varieties of antagonism, presented itself in the form of the civil war of 1861-65; and concluded so far as the existence of slavery was concerned, with the edict of President Lincoln of Jan. 1, 1863: see EMANCIPATION, PROCLAMATION OF. This proclamation had been suggested, and the minds of the people prepared for it, by the act of congress of March 13, 1862, which forbade the employment of military force to return fugitives to slavery; and that of July 16, 1862, authorizing the confiscation of the property of secessionists,—designedly meant to free the slaves. The proclamation had but little immediate practical effect except within the lines of the federal army; but it gave system and regularity to the treatment of the whole question; which had previously, in the hands of federal commanders, been sufficiently undefined and chaotic. See Gurowski, *Slavery in History* (1860); Wallon, *Hist. de l'Esclavage* (1879); Ingram, *History of Slavery* (1895); and ABOLITIONISTS; ANTI-SLAVERY SOCIETY; KANSAS; MISSOURI COMPROMISE.

SLAVES, or SLAVONIANS (native name *Slowene* or *Slowane*, derived by some from *slawa*, fame, but better from *slowo*, a word; thus meaning "speaking," or "articulate," as distinguished from other nations, whom they called *niemetz*, or "mutes"), the general name of a group of nations belonging to the Aryan family whose settlements extend from the Elbe to Kamtchatka, and from the Frozen sea to Ragusa on the Adriatic, the whole of eastern Europe being almost exclusively occupied by them. They were settled in these regions before the dawn of history, and are comprehended by ancient writers under the designations of Sarmatians and Scythians. The original names of the Slavic tribes seem to have been Winds or Wends (*Venedi*) and Serbs. The former of these names occurs among the Roman writers, and later, in Jornandes, in connection with the commercial peoples of the Baltic sea; the latter is spoken of by Procopius as the ancient name common to the whole Slavic stock. The earliest historical notices extant represent the Slaves as having their chief settlements about the Carpathians, from which they spread northward to the Baltic, westward as far as the Elbe and the Saal, and later, after the overthrow of the kingdom of the Huns southward beyond the Danube, and over the whole peninsula between the Adriatic and the Black sea. These migrations ceased in the 7th c.; the division of the Slavic stock into separate branches became now more complete, and gradually they began to form into independent states. The various sections of the stock may be divided into two groups—the south-eastern and the western; the first comprehends (1), Russians; (2), Bulgarians; (3), Illyrians (Serbs, Croats, Winds); the second (1), Lechs (Poles, Silesians, Pomeranians); (2), Czechs or Bohemians (Czechs, Moravians, Slovaks); (3), Polabians, comprising the Slavic tribes of n. Germany, who are fast disappearing, by being absorbed in the Teutonic population. With the exception of Russia and, since the Berlin congress of 1878, of Servia and Montenegro, the once numerous Slavic kingdoms (Bohemia, Bulgaria, Moravia, Poland, etc.), have lost their independent sovereignty and been incorporated in other states—chiefly Turkey, Austria, Prussia, and Saxony. The Polabians never attained any distinct political footing. The whole of the Slavic populations are estimated at upward of 80,000,000.

The Slaves are represented by ancient writers as an industrious race, living by agri-

culture, and the rearing of flocks and herds; as hospitable and peaceful, and making war only in defense. The feeling of nationality was strong among them. The government had a patriarchal basis, and chiefs or princes were chosen by assemblies. But contact with the feudal institutions of the Roman-German empire gradually altered this primitive constitution. The Slavic princes strove after unlimited power like that of the emperors; and the chiefs sought to dominate over the people like the feudal nobility. In the course of the 11th, 12th, and 13th c. nobility became a hereditary privilege throughout the Slavic states. The worst kind of feudalism fairly took root, and the people sank into the condition of serfs. Between them and the nobles there was no third or middle class, as the peculiar privileges of the nobility prevented the growth of cities. See SERF, RUSSIA.

The religion of the ancient Slaves, like that of the Teutonic nations, seems to have been, in many of its features at least, a kind of nature-worship; not, however, without the idea of a One supreme power, to whom the other agencies were subordinate. From this some authorities infer that the system was originally a monotheism which in process of time had become obscured and confused by the infusion of foreign elements, and thus degenerated into polytheism, and finally pantheism. The chief deity, whose worship seems to have been common to all the Slavic tribes, was Swiatowit, with whom were associated on a nearer footing of equality than the other gods, Perun and Radegast—if, indeed, these three names do not merely denote different personations or manifestations of the same power. In this trinity Swiatowit is considered as most analogous to Mars and Zeus, Perun to Jupiter and Thor, and Radegast to Mercury and Odin. Of the numerous gods of an inferior order we may name Prowe, god of justice; Prija (= Freya), Venus; Bjelbog, the white god, and Cernobog, the black god; together with multitudes of demons and spirits, good and bad. The images of the Slavic divinities (a stone statue of Swiatowit was in recent times discovered in eastern Galicia) had a striking resemblance to those of India. Swiatowit had four heads, Rugewit (the god of war) had seven faces, and Perun four, and so on. The Slaves seem to have been not without some crude notion of existence and retribution after death. Worship was performed in groves and temples, cattle and fruits being offered by the priests, whose office must have been originally performed by the head of the family or chieftain, as the common name for priest and prince (*kniaz*) shows.—The eastern Slaves received Christianity from Byzantium in the 9th c. through the instrumentality of Cyril (q.v.) and Methodius; the western, from Rome and Germany.—See Schafarik, *Slav. Alterthümer* (Ger. translation, Leip. 1843). See PANSLAVISM.

SLAVIC LANGUAGE AND LITERATURE. The term Slavic, as applied to language or race, is a generic name (like Celtic or Teutonic) for a group of kindred languages and peoples belonging to the great Indo-Germanic or Aryan family. In its roots and structure the Slavic language exhibits a remarkable similarity to Sanskrit, but has become European, so to speak, in the course of a long literary development, begun *before* that of any of the other European families. Its peculiarities are quite marked. The leading characteristics of the Slavic tongues are the completeness of their system of declensions, the want of articles, the absence of pronouns in the conjugation of the verb, pure vowel-endings, the fixed quantity of the syllables, the free construction of sentences, and the richness of their vocabulary. The earliest dialect of Slavic that received a literary culture was the "old-Bulgarian," better known as the "church Slavic," which, however, failed to become the literary vehicle for all the Slavic peoples, inasmuch as the special dialect of each gradually acquired a literature of its own. Altogether, writers reckon eight distinct extant dialects of Slavic—1. The "new Bulgarian;" 2. The Russian; 3. The Servian or Illyrian; 4. The Polish; 5. The Bohemian; 6. The Slovak; 7. The Wendic; 8. The Polabic. Such of these as merit special treatment have received it.—See **BOHEMIAN LANGUAGE AND LITERATURE**, **POLISH LANGUAGE AND LITERATURE**, **RUSSIAN LANGUAGE AND LITERATURE**, **SERVIA** (*Language and Literature*).—In regard to Slavic literature, considering the articles just mentioned, it is only necessary to state that at present the Russian branch of the Slavic is the richest in the number of its published works; but, as regards literary merit, the Polish ranks first, having cultivated with great success almost all sorts of literature, and possessing in particular a very exquisite poetry. The Bohemian and Servian literatures both contain many fine and distinctively original productions, worthy of being more widely known than they are.—See Schafarik's *History of the Slavic Language and Literature* (1816); and Miklosich's *Vergl. Grammatik der Slav. Sprachen* (Vienna, 1876).

SLAVONIA, a territory of Austria-Hungary, forming with Croatia a province of Hungary. It is bounded on the n. by the Drave, on the e. by the Danube, on the s. by the long strip of marsh-land known as the Slavonian military frontier, which stretches between it and the Save. Area of the province of Croatia (q. v.) and Slavonia, 16,773 sq. m.; pop. '90, 2,200,977. The greater part of the surface of Slavonia consists partly of eminences clothed with vines and fruit-trees, and partly of fertile and swampy plains. The mountains are rich in coal, marble, copper, iron, and lead. The principal products are all sorts of grain, particularly maize and wheat, leguminous plants, and fruit in abundance, apples, pears, plums, walnuts, chestnuts, melons, wine, etc. There is little manufacturing industry in Slavonia.—The inhabitants of Slavonia belong

to the Slavic family (see SLAVES), and call their land Slavonska; themselves Slavonaz. They speak the so-called Illyrian or Serviad tongue. See SERVIA (*Language and Literature*). The Slavonians proper are a handsome, tall, and slender race. The prevailing form of religion is the Roman Catholic, but the non-united Greek church also numbers many adherents. Education is still in a backward state. Capital of the country, Essek (q.v.).

SLEAFORD, a t. of Lincolnshire, England, on the right bank of the Slea, a branch of the Witham, 17 m. s.s.e. from Lincoln, and 52 ft. above the level of the sea. It is a well-built and well-paved town, and has a fine church, built in the 13th century. Pop. '91, 4655.

SLEEP. This term is employed to designate that state of suspension of the sensory and motor functions which appear to alternate in all animals with the active condition of those functions, and which may be made to give place to it by the agency of appropriate impressions upon the sensory nerves. This definition, which we have borrowed from Dr. Carpenter's article on "Sleep" in Todd's *Cyclopædia of Anatomy and Physiology*, may seem somewhat complex, but cannot be simplified without rendering it less stringent. The necessity for sleep arises from the fact that the exercise of the animal functions is in itself destructive of the tissues of the organs which minister to them, so that if the waste produced by their action were not duly repaired, they would speedily become unfit for further use; and it is on the nutritive regeneration of the tissues which takes place during true healthy sleep that its refreshing power depends. While the sensory and motor functions are suspended during the condition we designate as sleep, the organic functions are uninterruptedly carried on, the respiratory, cardiac, and peristaltic movements proceeding with equal uniformity during the sleeping and waking states.

There can be no doubt that the state of sleep is one to which there is a periodical tendency, and that this disposition is so arranged as to correspond in its recurrence with the diurnal revolution of the earth. Although in man and most animals night is, from its darkness and silence, the natural period for repose, yet there are numerous exceptions to the rule. For example, amongst lepidopterous insects, butterflies are active during the day, hawk-moths during the twilight, and moths during the night. Amongst birds, the goat-sucker, or night-jar, and the owls, are nocturnal, and, as a general rule, the same is the case with carnivorous animals. The causes of sleep may be divided into the direct and the predisposing. The direct cause of sleep is that feeling of exhaustion or fatigue which is usually experienced when the waking activity has continued during a considerable portion of the twenty-four hours—a feeling that the brain requires repose; and, in fact, unless the brain be in an abnormal condition, sleep will at last supervene, from the absolute inability of that organ to sustain any further demands upon its energy. Among the predisposing causes which favor the access of sleep, we must especially notice "the absence of sensorial impressions; thus darkness and silence usually promote repose; and the cessation of the sense of muscular effort which usually takes place when we assume a position that is sustained without it, is no less conducive to slumber."—Carpenter's *Human Physiology*, 6th ed. 1864, p. 592. On the other hand, persons accustomed to live where there is a continuous noise, as in the neighborhood of mills or forges, often cannot sleep if the noise is suspended. These cases, however, probably fall within the next general predisposing cause—namely, the *monotonous repetition* of sensorial impressions. Thus the droning voice of an unimpressive reader or preacher, the gentle ripple of the ocean, the hum of bees, the rustling of foliage, and similar monotonous impressions on the auditory nerves, are usually provocative of sleep. In these and similar cases the influence of the impressions is exerted in withdrawing the mind from the consciousness of its own operations, and in suspending the directing power of the will; and this is the case, says Dr. Carpenter, "even when the attention is, in the first instance, *voluntarily* directed to them, as in some of the plans which have been recommended for the induction of sleep, when there exists no spontaneous disposition to it. In other methods the attention is fixed upon some internal train of thought, which, when once set going, may be carried on automatically, such as counting numbers, or repeating a Greek verb. In either case, when the sensorial consciousness has been once steadily fixed, the monotony of the impression (whether received from the organ of sense or from the cerebrum) tends to retain it there; so that the will abandons, as it were, all control over the operations of the mind, and allows it to yield itself up to the soporific influence. This last method is peculiarly effectual when the restlessness is dependent upon some mental agitation, provided that the will has power to withdraw the thoughts from the exciting subject, and to reduce them to the tranquilizing state of a mere mechanical repetition."

The access of sleep is sometimes quite sudden, the individual passing at once from a state of complete mental activity to one of entire torpor. More generally, however, it is gradual, the mind while remaining poised, as it were, between sleep and the opposite condition being "pervaded by a strange confusion which almost amounts to wild delirium; the ideas dissolve their connection with it one by one; and its own essence becomes so vague and diluted that it melts away in the nothingness of slumber."—Macnab, *Philosophy of Sleep*, p. 21. The amount of sleep required by man is affected by so

many conditions (among which must be especially mentioned *age, temperament, habits,* and previous exhaustion), that no general rule can be laid down on the subject. The condition of the *fetus* may be regarded as one of continuous slumber: on its first entrance into the world, the infant passes most of its time in sleep, and this is particularly the case in children prematurely born, such children seeming only to awake for the purpose of receiving food. During the whole period of growth, in which it is necessary that the *constructive* operations of the body should preponderate over the *destructive* processes, an excess of sleep is required; and by the time that adult age has been attained, and the constructive and destructive processes balance each other, the necessary amount of sleep has gradually fallen to about one-third or less of the diurnal cycle. In very old age, again, in consequence of the deficient energy of the nutritive process, a larger amount of sleep is required. With regard to the influence of temperature, it is observed that a plethoric habit of body usually predisposes to sleep, while thin wiry people of a nervous temperament require comparatively little sleep. Persons of lymphatic temperament are usually great sleepers, but this is probably due, as Dr. Carpenter suggests, to the fact, that "through the dullness of their perceptions they are less easily kept awake by sensorial or mental excitement" than persons of a happier temperament. The influence of habit is by no means inconsiderable on the amount of sleep required by individuals, and this influence may be brought to act on the protraction as well as the abbreviation of the usual period: as extreme examples, we may mention that Gen. Elliott, celebrated for his defense of Gibraltar, did not sleep more than four hours out of the twenty-four (which is probably the smallest allowance for rest compatible with a life of vigorous exertion); while Dr. Reid the metaphysician, could take as much food, and afterward as much sleep, as were sufficient for two days. Moreover, the influence of habit in producing an aptitude for repose, or a readiness to wake at particular periods, is well known. The sleep of soldiers during a siege, of sailors or others who must take their rest as they best can, will often come on at command; nothing more being necessary to induce it than to assume a recumbent, or, at all events, an easy position, and to close the eyes. Thus Capt. Barclay, in his celebrated match, in which he walked 1000 m. in 1000 successive hours, very soon got into the habit of falling asleep the moment he lay down.

The condition of the great nervous centers during sleep is a subject of much interest, on which considerable light has recently been thrown by the observations of Mr. Durham. These observations were made on a dog from which a portion of bone about as large as a shilling was removed from the parietal region of the skull, and the subjacent *dura mater* cut away so as to expose the brain; and Mr. Durham draws the following conclusions from them: 1. Pressure of distended veins upon the brain is not, as is generally believed, the cause of sleep, for during sleep the veins are *not* distended. 2. During sleep, the brain is in a comparatively bloodless condition; and the blood in the encephalic vessels is not only diminished in quantity, but moves with diminished rapidity; and this is corroborated by the observations of Dr. J. Hughlings Jackson on the ophthalmoscopic condition of the retina during sleep, the optic disk being then whiter, the arteries smaller, and the retina generally more anemic than in the waking state. 3. The condition of the cerebral circulation during sleep is, from physical causes, that which is most favorable to the nutrition of the brain-tissue.*

This article would be imperfect without a brief reference to the conditions in which there is either an excess or a deficiency of sleep. There are numerous instances on record in which sleep has been continuously prolonged for weeks, or even months. Dr. Carpenter refers to two such cases, namely, those of Samuel Chilton (*Phil. Trans.* 1694) and Mary Lyall (*Trans. Roy. Soc. Edin.* 1818). Blanchet, a French physician, has recently recorded three cases of what he terms "constitutional lethargic slumber" in the *Comptes Rendus*, 1864. In one of these cases, the patient, a lady aged 24 years, who had slept for 40 days when she was 18 years of age, and 50 days when she was 20, at length had a sleep of nearly a year, viz., from Easter Sunday, 1862, to March, 1863. During this period, a false front tooth was removed in order to feed her with milk and soup, her only food. She was motionless and insensible. The pulse was low, the breathing scarcely perceptible, there were no evacuations, and she showed no signs of leanness, her complexion remaining florid and healthy. In such cases as these, it is not a prolongation of healthy natural sleep that is present, but a condition of hysteric coma.

Again, there are certain states of the nervous system in which there is either an entire absence of sleep (and this may continue for many days, or even weeks) or incomplete sleeplessness. Complete sleeplessness is often a most important symptom of disease. It frequently accompanies certain forms of continued fever, inflammatory affections of the brain, the eruptive fevers, etc., and when it continues for many days and nights, delirium, followed by stupor, is very apt to supervene. When the wakefulness is unattended by any disorder sufficient to account for it, some serious disease of the brain is most probably impending, such as palsy, apoplexy, or insanity. Incomplete or partial sleeplessness is a symptom of far less grave import. It is of frequent occurrence in persons whose minds are much engaged, or whose occupations subject them to great mental exertion or to the vicissitudes of fortune. It is, moreover, a symptom of many

*See Dr. Crippie's theory as to the balance of the distribution of blood within the cranium, in the *Causation of Sleep* (1883).

chronic diseases, as gout, chronic rheumatism, skin-diseases, disorders of the urinary organs, dyspepsia, hysterica, etc. It may also be excited by certain beverages and articles of diet; thus green tea and strong coffee often occasion wakefulness, and a full meal of animal food late in the day often disturbs the sleep of persons accustomed to dine at an earlier hour.

In the treatment of sleeplessness, or *insomnia*, as it is usually termed by medical writers, the first indication is to remove the cause, which occasions it, and "more particularly to correct a close or contaminated air; to reduce the temperature of the apartment when it is high, and the quantity and warmth of the bedclothes: to remove all the excitants to the senses; to abstract the mind from all exciting, harassing, or engaging thoughts; and to remove or counteract the morbid conditions of which this is a symptom or prominent consequence."—Copland's *Dictionary of Medicine*, art. "Sleep and Sleeplessness." A careful regulation of the secretions, by the due use of purgatives and alteratives, will often remove this symptom; and recourse should not be had to anodynes and narcotics until morbid secretions and fecal accumulations have been completely got rid of. But these medicines are of great service when the system is thus prepared for their reception. The choice of the individual drug or combination of drugs must be dependent upon the peculiarities of the case, but, as a general rule, there is no more serviceable narcotic mixture for an adult than 25 or 30 minims of the solution of hydrochlorate of morphia (of the regular Pharmacopeia), and 10 minims of chloric ether, taken in half a wine-glassful of water; medicines of this class should, however, never be resorted to without the advice of a physician. See HYPNOTICS.

SLEEP OF PLANTS, one of the phenomena of irritability (q. v.) in plants. Light acts on plants as a powerful stimulus, essential to their active and healthful vegetation. When it is withdrawn the flowers of many plants close, and the greater number show a tendency to it, while leaves more or less decidedly incline to fold themselves up. The leaf-stalk also generally hangs down more or less, although in some plants it is more erect during sleep. The sleep of plants, however, is not always nocturnal. The flowers of some open and close at particular hours of the day. Thus the crocus is a morning flower, and closes soon after midday; while some flowers expand only in the evening or during the night. Their hours of vegetative rest are probably as essential to the health of plants as those of sleep are to animals. It was Linnæus who first observed the sleep of plants, in watching the progress of some plants of *lotus*, the seeds of which he had sown.

SLEEPERS, timbers laid *asleep* or resting along their whole length. They are chiefly used along the top of dwarf-walls for the support of the timbers of the ground floor of houses.—The timbers supporting railway rails, and laid at right angles to them across the railway, are also called sleepers.

SLEIDAN, or **SLEIDANUS**, JOHANN, original name Philipsohn, 1506–56; b. Sleida, near Cologne; studied law at Liege, Paris, and Orleans, but gave himself to classical literature. He became a Lutheran, resided in Strasburg, was made by the council of the town professor of law, and by the Protestant princes of the Smalkaldic league their historian, and sent in 1545 on an embassy to France and England. His chief work is *De Statu Religionis et Reipublica Carolo Quinto Cæsare Commentarii* (1553–6).

SLEIGHT OF HAND. See LEGERDEMAIN.

SLEMMER, ADAM J., 1828–68; b. Penn.; graduated at West Point in 1850; in the army was promoted for gallantry in the Seminole war; assistant professor of ethics and mathematics at West Point, 1855–59. At the outbreak of the civil war he was in command of a small garrison at Fort McRea; took possession of Fort Pickens, Jan. 10, 1861, which he held until relieved by Col. Brown; brig. gen. of volunteers, 1862; fought at the siege of Corinth; severely wounded at the battle of Stone river, 1862, and disabled from further service; brevetted brig. gen. for gallantry, 1865.

SLES'WICK, a duchy known till the 14th c. as South Jutland, formed part of the Danish dominions till 1864, when it fell into the hands of the Austrian and Prussian sovereigns. In terms of the treaty of 1867 it was incorporated with Prussia. The pop. in 1864 was 406,486. Within its old recognized limits it was bounded on the n. by Jutland, on the e. by the Little Belt and the Baltic, on the w. by the German ocean, and on the s. by Holstein, from which it was divided by the Eyder and the Kiel canal. The area was 3,492 sq. miles. The country consists in its eastern and central parts of a gently undulating plain, deeply indented with fiords and streams.

The numerous islands which skirt the w. coast of Sleswick have probably, at some not very remote period, formed part of the mainland, for navigation is so seriously impeded by the sand-banks, that this coast is now accessible for ships by only three passages. The cluster of small islands known as the Halligers, which lie, unprotected by dams, in the midst of these submerged sand-tracts, are so constantly exposed to the action of waves and storms, that the inhabitants are compelled to raise their houses on piles. On the eastern coast of Sleswick lie the islands of Alsen, Aroe, and Femern, where the principal bays and inlets are the Haderslev and Aabenrade fiords, opening into the Little Belt; the Flensborg fiord, the Slie, the Eckerndorfe fiord, and the

Kieler fiord, which formed the ancient boundary between Sleswick and Holstein on the s.e., while the Eyder completed it on the s.w. The principal branches of industry are agriculture, the rearing of cattle, fishing, and ship-building. The Slie is the chief seat of the herring and salmon fisheries, which, although still of some importance, are very inferior to those of the middle ages, when, according to the Danish historian, Saxo Grammaticus, herrings were so plentiful in the Belts and Cattegat, that they could be caught with the bare hands. The chief towns of Sleswick are Flensburg (q.v.), Sleswick, now capital of a Prussian province, a very ancient city, and formerly the key of Denmark (pop. '90, 15,123); Haderslev, Husum, and Tonder. In the s., and partly in Holstein, Rendsborg (pop. '90, 13,195). With regard to the language spoken by the mixed population of the duchy, it may be asserted that rather more than the half speak Danish; and of the remainder, about 30,000 persons who belong to the islands on the western coast, which once formed part of the old province of North Friesland, still use the Frisic language, the rest of the inhabitants using either low or high German. The original Danish element of Sleswick has remained purest in the northern half of the duchy; while in the southern parts, where the inhabitants are naturally brought much in contact with Holstein, they have of late years adopted the views, tastes, and language of their German neighbors. The Lutheran is the established religion of Sleswick.

In accordance with the conditions stipulated in the treaty of Vienna, Aug., 1864, by which the duchies of Holstein and Sleswick were ceded to Austria and Prussia, the island of Aroe and other districts of Sleswick, measuring about 115 sq.m., were to be reunited to Denmark; while the latter power was to give in exchange a territory of about 130 sq.m., which, although situated within the boundary of Sleswick, had hitherto been under the jurisdiction of Jutland.

Sleswick, which forms part of the ancient Cimbrian peninsula, has from the earliest period been a debatable land between Danes and Germans; and according to the authorities of the latter, it was anciently included in the marches of the empire, having been incorporated by Henry the Fowler in 930, and reorganized by Otho I., when in 948 the latter erected bishops' sees in Aarhus, Ribe, and Sleswick. In 1027 the Danish king Knud (our Canute) obtained from Conrad II. the recognition of the independence of Sleswick, which was declared to belong unconditionally to Denmark, and thenceforth given as a Danish fief of the crown to the younger sons of the royal house. In 1232, king Valdemar Seir, whose father, prince Knud Laward, had ruled ably over the duchy, gave Sleswick—which was then, and for some time later, known as South Jutland—to his younger son Abel. The exact terms of the donation became a subject of dispute, during the successive reigns of Valdemar's sons, Eric, Abel, and Christopher, and began the long course of civil wars and family feuds which are associated with this much-contested territory. Abel, and his sons after him, backed by their kinsmen, the counts of Holstein, maintained that Valdemar had given the duchy as an hereditary, inalienable, and indivisible fief; while, on the part of the Danish crown, it was contested that South Jutland was merely a *precarious* fief, which might be recalled at the pleasure of the sovereign. Its vicinity to Holstein tended to keep up the feuds, to which the vexed question of its mode of tenure had given occasion, and which, in fact, only ceased when the resources of the conflicting parties were exhausted, although the bitterness and ill-will with which they were fed seemed to know no intermission. The following brief summary gives the skeleton of the leading events of the history of Sleswick from the dawn of its troubles till the final outbreak in 1848, when, by the influence of the neighboring Holstein nobles, the Germanized great landed proprietors of Sleswick entered upon the course of armed opposition to the mother-country, which has culminated at the present moment in the forcible separation from the Danish crown of the duchy of Sleswick, and its imminent incorporation in the Prussian monarchy. In 1386, queen Margaret (q.v.) gave Sleswick in fief to Gerhard, duke of Holstein; and on the extinction of his male heirs in 1459, it virtually lapsed to the crown, with which it was united in 1460 under the rule of Christian I. (the founder of the Oldenburg line), by a mode disastrous to the integrity of the Danish monarchy. See DENMARK. After frequent division among the younger members of the royal house, which gave rise to a great number of collateral lines of the Oldenburg family (of which the Glucksburg-Sonderborg and the Augustenburg are, with the exception of the imperial house of Russia and the ducal house of Oldenburg, the chief representatives), the ducal portions of Sleswick were inalienably incorporated with the crown of Denmark under king Frederick IV. in 1721. This act, which had the guaranty of the great powers, had resulted directly from the treasonable attitude maintained in the previous wars with Sweden by the Holstein-Gottorp princes of Sleswick, and was ratified by Russia and Sweden, no less than by England and France. The different orders of the duchy took the oaths of allegiance for themselves and their heirs, the Sleswick arms were quartered with those of Denmark proper, and the duchy was included with the latter in one common mode of administration. In 1848, the revolutionary movement of continental Europe fanned the flame of discontent in the duchies into a blaze, and the upper classes of Sleswick, who had in the course of time become strongly imbued with the German tendencies of the Holstein nobles, with whom they fraternized, joined the latter in open armed rebellion under the

chief leadership of the princes of Augustenburg. The Germanized Sleswick nobles, influenced by the principles of hatred to Denmark, which had long been gathering strength in the university of Kiel, refused to admit the difference between their relations to the crown and those of the Holsteiners, with whom they demanded to be indissolubly associated in separate legislative and executive chambers. The king refused to separate Sleswick from the monarchy; the irritation increased on both sides; the royal troops appeared in the duchies to restore order; the Sleswick-Holstein army, whose ranks were principally filled by German volunteers, took the field, aided by the confederate forces sent by the diet to co-operate with the Holsteiners. The troubles by which the German states were threatened at home led, after a few indecisive engagements had been fought, to the withdrawal of the confederate armies, and Prussia having made a special treaty of peace (after a preliminary truce with Denmark), the duchies were left to themselves, and the royal authority re-established, on the understanding that the king should submit a new form of constitution for Holstein and Sleswick to the diet, on account of the former being a member of the confederation; Sleswick being in the meanwhile put under a provisional government of Danish, Prussian, and English commissioners. By the peace with Prussia, it was solemnly guaranteed that all old treaties, including that of 1721, should be maintained in regard to Denmark; and in 1851, Austria threw an army into the duchies to aid Denmark in supporting her authority, and in dissolving the joint Sleswick and Holstein assembly. On the death of Frederick VII. in 1863, prince Christian of Glücksburg (see DENMARK), having ascended the throne as Christian IX., king of Denmark, prince Frederick of Augustenburg called upon the Sleswick-Holstein authorities to refuse the oath of allegiance to the new king, and to acknowledge himself as the rightful duke of Sleswick-Holstein, basing his claims on his descent from the legitimate and elder male line of the house of Oldenburg. This appeal was responded to by 25 members of the Holstein diet, who, on behalf of their own duchy and of Sleswick, petitioned the German diet to recognize the validity of the claims of the Augustenburg line, and to pronounce the London protocol of the act of succession devoid of force. The prince, by this step, set at nought the family compact by which his father, uncle, and himself, for themselves and their heirs, had, at the close of the war of 1848, accepted a sum of money as full indemnity for all claims on the Danish territories, and been allowed on that condition to evade all further consequences of the open rebellion in which they had stood against the throne. In the meanwhile, the fundamental law of Nov., 1863, for the kingdom of Denmark and the duchy of Sleswick, which had passed the rigsråd, and received the late king's signature shortly before his death, was published, together with a manifesto of Christian IX., stating his intention in regard to Holstein and Lauenburg. The diet, without committing itself to uphold the Augustenburg claims, put a confederate execution into Holstein; the Danish troops were withdrawn into Sleswick; and on Jan. 6, 1864, the Holstein towns did homage to the duke; while a federal commission suppressed the provisional Holstein government, which had exercised its powers since 1862, and established a ducal government at Kiel. The Austrians and Prussians, professing to act for the diet, summoned the Danish king to withdraw the constitution of November within 48 hours; in reply to which the Danish government demanded a term of six weeks to convoke the rigsråd, without whose sanction no constitutional change could be adopted. The demand was rejected, and the Austro-Prussian army entered Holstein, and hostilities commenced. For ten weeks the Danes made a gallant stand against their enemy, whose enormous superiority in strength of numbers, and in the efficiency of their artillery and small-arms, made their final victory the inevitable rather than the glorious result of the campaign. The Danes were compelled to suspend hostilities, and to submit to the terms dictated by their conquerors. A conference was held at Vienna, and, after protracted negotiations, Denmark was constrained to accept peace (Aug., 1864), on the hard terms of ceding to Austria and Prussia, Holstein, Sleswick, and Lauenburg, on the ground that the indivisibility of the two duchies must be firmly established for the German fatherland by these two great powers. Following upon this, duke Frederick of Augustenburg was in turn the favored and the rejected candidate for the throne of the new state of Sleswick-Holstein. The upper classes in small numbers in Sleswick, in Holstein almost unanimously, were in favor of his claims, while the burgher and lower classes of Sleswick appeared equally unanimous in regretting their severance from Denmark; and the decidedly expressed wishes of the Holstein party, backed by the lesser German states, to have the duke as their sovereign, the protests and counter-protests of the diet and of foreign powers, all resulted in an announcement by Austria and Prussia that according to the evidence of the commission appointed to examine the merits of the various claims of Denmark, Augustenburg, and Oldenburg to the duchies, Christian IX. was by right of succession the undoubted possessor, and that from him the duchies had passed by right of victory to Austria and Prussia. Prussia sought to annex these duchies to her dominions, and offered Austria pecuniary compensation for her assistance in the war. On the other hand, Austria advocated the independence of the duchies. Neither country would yield, and the dispute ultimately resulted in the war of 1866. According to a treaty concluded in 1867, Austria abandoned her claims in favor of Prussia, but stipulated that a part of Sleswick should be restored to Denmark. This stipulation, however, has never been given effect

to. See GERMANY. The Prussian province of Sleswick-Holstein, formed out of the duchies of Sleswick and Holstein, has an area of 7299 sq. m. and a pop. of (1885) 1,150,306; (1890) 1,217,393; (1895) 1,286,416 (including Heligoland).

SLICKENSIDES are the smooth and polished, and generally glazed, surfaces of flaws in rocks. They are considered to have been produced by the friction of the two surfaces during some movement of the rock. But the two surfaces of the flaw are almost always so uneven that it is impossible to conceive that they could have rubbed against each other; besides, the flaws are generally very small, and the true slickenside is always confined to a single stratum, never passing into the bed above or below. We believe they are the castings of liquids or gases confined in the bed, and subjected to great pressure, and are similar in origin to the glazed cavities produced by gases in slags, or, to use a very familiar illustration, by the compressed steam in breakfast rolls.

SLIDE, a piece of mechanism applied to instruments of the trumpet and trombone family, for lengthening and shortening the sounding tube. By its means the gaps are filled in between the fundamental note and its succeeding harmonies. The slide was known at an early date. In the G bass trombone the length of a man's arm is not sufficient to reach the lower slide positions and a jointed handle fixed to the cross-bar of the slide aids in the mechanism of the instrument. See *Trombone*. The word slide is also applied to an ornament in both vocal and instrumental music. The English name slide is almost obsolete, but it signifies a group of three notes, either ascending or descending, which contain one note to be accented and two grace notes.

SLIDELL, JOHN, 1793-1871; b. N. Y.; educated at Columbia college. Settling in New Orleans he became distinguished at the bar; was a member of Congress, 1843-45, when he was appointed minister to Mexico; was elected to the U. S. senate for a partial term in 1853, and afterward re-elected. He left the senate on the passage by Louisiana of the act of secession in 1861; the same year was appointed commissioner to France, ran the blockade to Havana, from which, with Mason, commissioner to England, he sailed on the British mail steamer *Trent*, which was boarded, Nov. 8, by capt. Wilkes, of the U. S. steamer *San Jacinto*, who arrested both the commissioners. They were confined in fort Warren, Boston, but released on the demand of the British government, and sailed for England. Slidell succeeded in obtaining some help for the confederates in Paris. He settled in London at the end of the war.

SLIDING RULE, an instrument invented by the Rev. William Oughtred, an English divine and mathematician, for the purpose of solving arithmetical problems mechanically, consists of three pieces of wood, of which two are fastened together by slips of brass at a sufficient distance from each other to permit of a third sliding between them. The size of instrument which best combines convenience with accuracy is one about 2 ft. long, 2 in. broad, and $\frac{1}{4}$ in. thick. One side of the rule has the following scales marked on it in order: a line of tenths of in., of equal parts divided into tenths and hundredths of ft.; three lines of numbers, each line consisting of the numbers from 1 to 10 twice repeated; a line of sine rhumbs (logarithmic sines of each quarter-point of the compass); a line of meridional parts; and a line of equal parts. Of these, two of the lines of numbers are on the middle piece or *slider*. On the other side are—two lines of *natural scales*, including sines, secants, tangents, equal parts, etc.; two lines of logarithmic sines, two lines of logarithmic tangents, a third line of logarithmic sines, and a line of versed sines. Of these, one line of logarithmic sines and one of tangents are upon the slider. The scale in most common use is that of numbers, and a description of the way in which it is used will give a key to the whole working of the instrument. It is necessary, however, to notice as a preliminary, that the scale of numbers is not evenly divided, as in this case only addition and subtraction could be performed, but is divided in proportion, not to the numbers, but to their logarithms, so that 3, whose logarithm is very nearly the half of that of 10, stands almost half-way between 1 and 10; and similarly of the other numbers. All questions of numerical proportion can thus be easily worked by means of the line of numbers on the slider, and the adjacent and corresponding one on the fixed part of the rule. To find a fourth proportional to three given numbers, we place the first term (on the slider) opposite to the second term (on the fixed scale), and opposite the third term (on the slider) is the fourth or number required (on the scale). Multiplication is performed by making 1 the first term of a proportion, and division by making it the second or third. The other scales marked on the rule are useful in the solution of trigonometrical, geographical, and nautical problems, and the results obtained are much more accurate than one at first sight would believe. Sliding rules of circular form have been made by the French, but they are not in any way preferable to the ordinary straight form.

SLIDING SCALE, a provision in some of the English restrictions formerly in force on the trade in corn, by which, in order to encourage importation: when prices were high, and discourage it when low, the import duty was diminished as the price rose, and at famine-prices grain came in duty free. By the act of 1828 wheat was allowed to be imported on payment of a duty of £1 4s. 8d. when the average price over England was 62s. a quarter. For every shilling less of price, a shilling was added to the duty; and for a rise of price, the duty decreased. In 1842, while the agitation regarding the corn-laws was going on

sir Robert Peel introduced and carried a modification of the sliding scale which, however, did not succeed in mitigating the popular hostility to the corn-laws. By the sliding-scale act of 1842, the duty per quarter was fixed at £1 when the price of corn was under 51s., and diminished as the price increased, till on the quarter of wheat attaining the price of 73s. it fell to 1s. See CORN LAWS.

SLIGO, a maritime co. of the province of Connaught, Ireland, bounded on the n. by the Atlantic and the bay of Donegal, s. by Roscommon and Mayo, e. by Roscommon and Leitrim, and w. by Mayo. It is 41 m. from e. to w., and 38 from n. to s.; the total area is 452,000 acres, of which about 79,000 are under tillage, and the remainder uncultivated. The pop. in 1861 was 124,845; in 1891, 98,013, of whom 89,191 were Roman Catholics. The coast-line is indented with numerous bays, and except in the bay of Sligo, dangerous for navigation. The surface rises gradually from the coast eastward as far as an elevated range called Slieve Gamp and the Ox mountains, the highest point of which rises to 1800 feet. Sligo contains comparatively few and unimportant lakes, but some of these, however, are extremely picturesque, especially lough Arrow and lough Gill. Only three of its streams are navigable—the Moy, the Owenmore, and the Garroogue, and they are all inconsiderable. The county is traversed by a railway, which is a branch of the Midland Great Western, and connects the county town of Sligo (q.v.) with Dublin. The mineral products of the county, although not very rich, are various, and consist of copper, lead, iron, and manganese. The climate is variable, and although rain is frequent, it is, on the whole, mild and healthy. The soil in the n. is mossy and sandy, both being occasionally intermixed, and at times alternating with a gravelly loam. The plain of Sligo is a deep rich loam; and in the southern portion of the county are found large tracts of corn-land and pasturage. The occupations of the people are mainly agricultural, and until some years back, they were engaged chiefly in tillage; but the land is now used chiefly for pasturage. The sea and salmon fisheries are important, and there are manufactures of woollens, linens, and leather.

Sligo was anciently the seat of the O'Connors, and was the scene of many conflicts between the several branches of that family. The domestic feuds of the O'Connors were among the causes which facilitated the first inroads of the Anglo-Normans. The district contains many remains both of the Celtic and of the Anglo-Norman period. Of the former, there is one very interesting called the Giant's Cairn, near Sligo; and there are many raths, cromlechs, and ancient caverns. The county of Sligo sends two members to the imperial parliament.

SLIGO, chief t. of the co. of the same name, situated on the river Garroogue; distant from Dublin, with which it is connected by a branch from the Midland Great Western railway, 131 m. n.w. Pop. '61, 13,361; '91, 10,274, being a decrease in 30 years of 3,087. Sligo had its origin in the erection of a Dominican abbey in the 13th c. by Maurice Fitzgerald, earl of Kildare, around which—and a castle also built by him—a town was gradually formed. In the reign of James I. it received a charter. The modern town stands within a bend of the river, chiefly on the left bank. It is for the most part well built, and contains several handsome public edifices. It possesses few important manufactures, but is a place of considerable commerce, which is directed with judgment and energy by a body of town and harbor commissioners. The exports are chiefly of cattle, corn, flour, meal, butter, provisions, and yarn. There are a town hall, a Roman Catholic cathedral, and the ruins of an old abbey. Steamers ply regularly between Sligo and Glasgow, Liverpool, and Londonderry. Sligo formerly returned a member to parliament, but was disfranchised in 1870.

SLING, a weapon much in use before the introduction of firearms, consisted of a piece of leather, with a round hole in the middle, and two cords of about a yard in length. A round pebble being hung in the leather by the cords, the latter were held firmly in the right hand, and swung rapidly round. When the stone had attained great speed, one string was disengaged, on which the stone flew off at a tangent, its initial velocity being the same as it had at the last moment of revolution. This velocity gives far greater range and force than could be imparted in mere throwing.

SLIP, in a dockyard, is a smooth, inclined plane, sloping down to the water, on which a ship is built. It requires to have a very solid foundation. Among modern inventions is a slip on which a sort of truck runs on numerous rails. This truck is run under a ship as she floats; the water is diminished till she rests on it, and it is then hauled up the slip by steam power until she is high and dry. Such a slip takes the place of a dry dock. See also LAUNCH and SHIP-BUILDING.

SLIPPED, in heraldry, a term of blazon applied to a leaf, branch, or flower, which is represented with a stalk, and torn from the parent stem.

SLOAN, SAMUEL, b. Ireland, 1817; brought to New York, 1819; received a common school education; after holding office in King's co., N. Y., was elected president of Hudson River railroad company, 1855; and president of the Delaware, Lackawanna, and Western railroad company, 1867; which last office he still holds. He is also president of railroads in Michigan and Texas.

SLOANE, Sir HANS, an eminent physician and naturalist, of Scotch parentage, his father having been the chief of the Scottish colony which was settled in Ulster by

James I. of Great Britain, was born at Killyleagh, in county Down, Ireland, April 16, 1660. He devoted himself during his boyhood to natural history and medicine, and in spite of an attack of hæmoptysis, which lasted from his 16th till his 19th year, he arrived in London in 1679, with an excellent knowledge of the first of these sciences, and a fair acquaintance with the second. His apprenticeship to Stafforth, a pupil of Stahl (q.v.), and the acquaintance, subsequently ripened into close friendship, which he formed with Boyle and Ray, two of the most celebrated naturalists of their time, did much to encourage and advance him in his favorite studies. During a brief sojourn in France he attended the lectures of Tournefort and Du Verney, obtained on his return, by the active support of Sydenham (q.v.), a footing in London as a physician, and was elected a member of the royal society in 1685, and of the royal college of physicians in 1687; but in September of the latter year, he accompanied Monk, duke of Albemarle, to Jamaica, and investigated the botany of that and the adjoining islands with such zeal and diligence during the 15 months of his stay, that his herbarium numbered 800 species. Resuming his professional practice on his return, he became physician to Christ's hospital (1694-1724), president of the college of physicians (1719-1735), secretary to the royal society (1693), foreign associate of the French academy of sciences (1708), and succeeded sir Isaac Newton as president of the royal society in 1727. He had been created a baronet and physician-general to the army in 1716; and in 1727 received the further honor of being appointed royal physician. Though of remarkably delicate constitution he lived to the great age of 92, dying at Chelsea, Jan. 11, 1753. The chief point to be remarked in Sloane's moral character was his benevolence, as shown in the charitable uses to which he applied the whole of his salary as physician of Christ's hospital, in his zealous promotion of the various schemes for affording medicine and attendance gratuitously to the poor, and his support of the foundling hospital, of which he was one of the founders. By long-continued perseverance he succeeded in forming a most extensive museum of natural history, a library of 50,000 volumes, and 3,560 MSS., which he directed to be offered at his death to the nation for £20,000 (about one-fourth of its real value), and which formed the commencement of the British Museum (q.v.). He also contributed numerous memoirs to the *Philosophical Transactions*, whose publication he superintended for a number of years. But his great work was the *Natural History of Jamaica* (fol. 1707-1725), containing also an excellent account of the topography, meteorology, and population of the island, which book was the means of introducing into the pharmacopœia a number of excellent drugs, hitherto unknown.

SLOAT, JOHN DRAKE, 1780-1867; b. New York city; entered the navy as sailing-master, 1800; was in the engagement between the *United States* and the *Macedonian*, 1812. He participated in the expedition against the West Indian pirates, 1824-25; commanded the Pacific squadron, 1846-52; was commandant at the Norfolk navy yard, and superintended the building of Stevens's battery at Hoboken; retired with the rank of commodore, 1862; rear-admiral, 1866.

SLOCUM, HENRY WARNER, b. N. Y., 1827; graduated at West Point, 1852; was lieut. in various military services, 1852-56; became a lawyer at Syracuse, and was in the state legislature, 1859; appointed col. of the 27th N. Y. regiment, which he led at Bull Run where he was severely wounded; made brig. gen. of volunteers, and after his recovery commanded a brigade in Franklin's division of the Army of the Potomac in campaign of 1862; was at the siege of Yorktown; commander of the division on Franklin's transfer to the 6th corps; at the battle of Gaines's Mill rendered important service; at Glendale and Malvern Hill held the right of the main line; maj.-gen. of volunteers July 4th, and engaged at second battle of Bull Run, South Mountain, and Antietam; in October made commander of 12th corps, which he led at Chancellorsville and Gettysburg, in command of the right wing of the army; April, 1864, was placed in command of the district of Vicksburg; in August succeeded Gen. Hooker in command of 20th corps; in Sherman's march to the sea, commanded the left wing of the army—participating in all the engagements to the surrender of Johnston. After the war Gen. Slocum was a member of the 41st and 42d Congress. He died April 14th, 1894.

SLOBODSK', or SLOBODSKOY', a t. of Russia, in the government of Viatka, is situated on the river Viatka, about 20 m. n.e. of the town of the same name. Pop. '93, 7739.

SLOE, or SLOE-THORN, *Prunus spinosa*, a shrub of the same genus with the plum, and perhaps really of the same species with it and the bullace. It is generally a shrub of 4 to 10 ft. high, sometimes becoming a small tree of 15 to 20 feet. It is much branched, and the branches terminate in spines. The youngest shoots are covered with a fine down. The flowers are small, snow-white, and generally appear before the leaves. The fruit is ovate, or almost globose, pale blue with blackish bloom, and generally about the size of the largest peas. The sloe is abundant in thickets and borders of woods, and in arid places in Britain and almost all parts of Europe. The shoots make beautiful walking-sticks. Although spiny, the sloe is not suitable for hedges, as its roots spread, and it encroaches on the fields. The bark is bitter, astringent, and tonic. The flowers, with the calyx, are purgative, and are in some places much used as a domestic medicine. The leaves are used for adulterating tea. The unripe fruit dyes black. The fruit is very austere. It is much used on the continent of Europe for making a preserve, also in some places for making a kind of brandy. An astringent extract, called *German acacia*,

is prepared from it, which was once much employed in cases of diarrhœa and mucous and bloody discharges. The juice is much used to impart roughness to port wine, and in the fabrication of spurious port. See illus., BOTANY, vol. II.

SLO-NIM, a t. of European Russia, in the government of Grodno, and 105 m. s.e. of the town of that name. It has some trade and large manufactures of cloth. Pop. '94, 25,646.

SLOOP is a one-masted cutter-rigged vessel, differing from a cutter, according to old authorities, in having a fixed bowsprit and somewhat smaller sails in proportion to the hull. The terms "sloop" and "cutter" appear, however, to be used nearly indiscriminately. In the American navy, a sloop-of-war is a vessel, of whatever rig, between a corvette and a gun-boat, and ordinarily constituting the command of a commander. In the days of the sailing navy, sloops-of-war carried from 10 to 18 guns.

SLOT. (Scotch *sleuth*.) A deer's trail or track. "As a blood-hound follows the *slot* of a hurt deer." In Mechanics, a depression or mortise cut in a metal plate, or a slit through it, for the purpose of receiving some part of a machine either fixed or movable.

SLOTH, *Bradypus*, a genus of mammalia, of the order *edentata*, and family *tardigrada*. The name was given from observation of the very slow and awkward movements of the animals of this genus on the ground; but a better acquaintance with their habits, and observation of their movements among the branches of trees, for which their conformation peculiarly adapts them, have shown it to be by no means appropriate or descriptive. In like manner, Buffon's notion that they are creatures of imperfect organization, and doomed to a miserable existence, has been completely exploded. Their structure, like that of every other creature, is admirably adapted to their mode of life. They feed on the leaves, buds, and young shoots of trees, among the branches of which they are born and spend their whole life, rarely and unwillingly descending to the ground. They do not walk upon the branches, but cling beneath them, with the back downward. The fore-legs are much longer than the hinder ones, and are used for embracing a branch, or for drawing in the branches on the foliage of which they are to feed, and both the fore and hind feet are furnished with very long, curved, and sharp claws. The pelvis is very wide; and the hind-legs, thus widely separated, also diverge from one another. The structure of the wrist and ankle-joints is such that the palm or sole is turned toward the body, so that upon the ground, the animal is compelled to rest on the side of the hind-foot, while the length of the fore-legs causes it to rest on the knee or elbow of them, struggling forward by a shuffling movement, and dragging itself along by stretching out the fore-legs alternately and hooking the claws into the ground, or grasping some object. But in a dense tropical forest, sloths generally find it easy to pass from the branches of one tree to those of another, often taking advantage for this purpose of a time when branches are brought within their reach by the wind. Where the trees are more distant from each other, they will eat up the whole foliage of a tree ere they descend from it. The hair of sloths is coarse and shaggy, of a very peculiar texture, inelastic, and much like grass withered in the sun, but affords an excellent protection from insects, while it also gives them such an appearance that they are not readily observed except when in motion. The muzzle of sloths is short, and the tail is short. There are no incisor teeth, but sharp canine teeth, and eight molars in the upper, six in the lower jaw. The molars are cylindrical, penetrated by no laminae of enamel, and adapted merely for crushing, not for grinding, the food. For this, however, there is compensation in the stomach, which is somewhat imperfectly divided, by transverse ligatures, into four compartments, for the longer retention and more thorough digestion of the food, although there is no rumination. The female sloth produces only one young one at a birth, which clings to its mother till it becomes able to provide for itself. The voice of sloths is a low plaintive cry. Their chief enemies are large snakes, but against these they defend themselves by their powerful fore-legs and claws. A sloth has been known to grasp a dog round the neck and strangle it. There are very few species. One species has the fore-feet furnished with only two toes: the others have three. These, with other differences, have been made the ground of a recent division of the genus into two. The **TWO-TOED SLOTH** or **UNAU** (*Bradypus* or *Cholepus didactylus*) is about two ft. in length, of a uniform grayish-brown color, often with a reddish tint. The best known species of **THREE-TOED SLOTH** is the **AI** (*Bradypus* or *Acheus tridactylus*), which is smaller than the Unau, has a more obtuse muzzle, and is generally brownish gray, slightly variegated with hairs of different tints, the head darker than the body. All the sloths belong to the tropical parts of America. See illus., MARSUPIALIA, vol. IX.

SLOT TING-MACHINE, a machine for cutting slots, or square grooves, in metal. It is of great importance in mechanical engineering, and many very ingenious inventions have been made for facilitating the process. The principle is, however, very simple, and is the same in all. It consists of a cutting tool, or chisel, held very firmly in an arm, which is pressed down and raised alternately. The tool is thus made to pare off a thin portion of the metal each time it descends, until it has cut a slot of sufficient size. Water is continually thrown on to prevent the metal from becoming overheated by the friction.

SLOUGH, a village of England, in the county of Buckingham 18 m. w. of London, by the Great Western railway. On the road between Slough and Windsor, which is distant about $2\frac{1}{2}$ m., lived sir William Herschel, and at the observatory which he erected here, in which was placed his great telescope, many of his important astronomical discoveries were made. Pop. '91, 5426.

SLOVAKS, THE, are the Slavic inhabitants of north Hungary, who in the 9th c. formed the nucleus of the great Moravian kingdom, but who, after the bloody battle of Presburg (907 A.D.), were gradually subjugated by the Magyars, to whom even yet they bear no friendly feeling. The Slovaks who are of a soft, pliant disposition, and industrious character, number about 1,900,000, and are mostly Catholics. The Slovaks whose character probably comes nearest to that of the old Slavic type, travel in great numbers over Germany and Poland as pedlars. Their language is a dialect of Bohemian. Among the most notable of the Slovak authors are the poets Holly and Kollar (q.v.); Matth. Bel (1684-1749); Stephan Leschka (1757-1818), editor of the first Slovak journal; Bernolak, author of a Slovak grammar; Palkovitsh (died 1835); and Tablitsch, who published four volumes of poetry (1806-12). A fine collection of popular Slovak ballads has been published by Kollar (2 vols., Ofen, 1834).

SLOVENTZI, or **VINDS**, a south Slavic race found in Hungary and other Austrian provinces, numbering 1,260,000 chiefly Roman Catholics of the Latin rite. They are sometimes confounded with the Wends, who are a distinct though remotely kindred people. The language, related to the Servian, is written in Roman characters, and at the rise of the reformation, was beginning to receive literary culture. There is some recent literature, chiefly religious.

SLOW-MATCH, a combustible material, such as cotton, hemp, tow, etc., often dipped in a solution of nitrate of potash (saltpeter), and formed into a thin rope. It is used for exploding gunpowder in various ways on account of its slow, steady way of burning, a sufficient length being taken to enable the operator to remove to a safe distance before the explosion. Slow-match was much used by artillerymen for firing of cannon, but it has been generally given way to friction fuses and percussion caps.

SLOYD (Swedish, *slöjd*). See **MANUAL TRAINING**.

SLUBBING. See **SPINNING**.

SLUG, *Limax*, a genus of gasteropodous mollusks, of the division *monœcia* (hermaphrodite), and of the family *limacidae*, which is closely allied to the snail family, *helicidae*, but has no external shell. There is, however, a rudimental shell, generally concealed within the mantle, placed over the respiratory cavity. The *limacidae* are diffused over the whole world. They commit great ravages among field and garden crops during moist weather. In frosts they become dormant, taking shelter under clods and at the roots of plants. They lay eggs in clusters in moist places, often at the roots of grass. The eggs resemble small oval bags of jelly. The body is generally oval or oblong, elongated. The foot is not distinct from the body. There are four retractile tentacles; the eyes are at the tips of the longer pair. Slugs often climb trees in quest of decaying vegetable matter on which to feed, and let themselves down by means of mucous threads, for the formation of which there is a small aperture at the hinder end of the body. Of British species, one of the most common is the **GRAY SLUG** (*limax agrestis*), which is of a whitish ash color; another is the **GREAT GRAY SLUG** (*L. maximus* or *antiquorum*), the largest British species; another is the **BLACK SLUG** (*L. ater*), often popularly called the black snail. The **RED SLUG** (*agrion agrestis*) is also very plentiful. Careful gardeners often gather slugs by the aid of a lantern at night, and destroy them. They may also be killed by watering the ground with a weak solution of ammonia.

SLUR, in music, an arch drawn over two or more notes *not* on the same degree, to indicate that these notes are to be played *legato*, or smoothly and fluently



In vocal music, a slur is placed over all the notes that are to be

sung to the same syllable, unless where they are grouped together by a common line. A slur must be distinguished from a *tie*, which is a similar arch drawn over two notes on the same degree, and denoting that instead of the two notes written, one is to be played of the length of both.

SLUTSK, a t. of European Russia, in the government of Minsk, about 60 m. s. of the town of that name, near the source of the lesser Slutch. Pop. '93, 18,041.

SMACK is a generic term for small decked or half-decked vessels employed in the coasting and fishing trade. The majority of smacks are, however, rigged as cutters, sloops, or yawls. According to Wedgewood the *m* in this word is a corruption of *n*; the Anglo-Saxon has *snakk*, a small vessel, and there is a corresponding form in the other Teutonic and Scandinavian tongues.

SMALCALD. See **SCHMALKALD**.

SMALL-ARMS, in the modern acceptation, consist of the weapons actually carried by a man. They have been described under their respective heads, **BAYONET**, **FIRE-ARMS**, **LANCE**, **SWORD**, **PISTOL**, etc.

SMALL-ARMS FACTORIES, **ROYAL**, are the establishments through which all the small arms of every description are supplied to the English army, the militia yeomanry, and volunteers. The headquarters are at Enfield, where there is a vast manufactory; and at Birmingham there is a considerable establishment for viewing the arms supplied by contractors. For many years there had been a small ordnance factory at Enfield lock, where a few thousand muskets were laboriously forged by hand each year; but when the sudden introduction of the rifle, and the demands of the Russian war, called for a supply of arms, which the trade of all Europe and America was unable to meet, government determined to erect machinery for the fabrication of arms. For this purpose the factory at Enfield was entirely remodeled; machinery of great power and delicacy was adopted; and now, when in full work the factory can turn out daily 1000 complete and proved rifles, besides a corresponding complement of other small-arms. At the same time the accuracy of workmanship is so great that a hundred rifles might be taken entirely to pieces, the several portions thrown promiscuously together, and a hundred complete rifles could be forthwith re-formed without any difficulty from the same pieces. Much of the merit of this great establishment was due to maj.gen. Manley Dixon of the royal artillery, who long superintended the factory after it was remodeled. The success of the factory has reduced in a remarkable degree the cost of rifles, and has brought down correspondingly the price charged by the trade for the large quantities still intrusted to it.

SMALLEY, **GEORGE WASHBURN**, an American journalist, born in Mass. in 1833; graduated at Yale university 1853, studied law at Harvard, and practiced in Boston; became war correspondent for the New York *Tribune* 1861, and an editor of that newspaper a year later. He went to the Austro-Prussian war, 1866, as correspondent for the *Tribune*; lived in London from 1867 as correspondent of the same paper until 1895, when he returned to the U. S. as correspondent of the London *Times*.

SMALL-POX, or **VARIOLA**, is one of the most formidable of the class of febrile diseases known as the *exanthemata* (q.v.). All cases of regular small-pox are divisible into three stages—viz.: (1), that of the initial or eruptive fever; (2), that of the progress and maturation of the specific eruption; and (3) that of the decline. Some writers make a primary stage of the period of incubation, or of the time intervening between the reception of the poison into the system, and the first appearance of febrile symptoms; but this is not entitled to be regarded as a stage of the disease, seeing that no symptoms of disorder have begun to show themselves. The *first stage* begins with rigors, followed by heat and dryness of the skin, a quickened pulse, furred tongue, loss of appetite, pain in the pit of the stomach, with nausea, vomiting, headache, and often pains in the back and limbs. The violence of the pains in the back, and the obstinacy of the vomiting, are frequently very well marked and characteristic symptoms. In children, the disease is often ushered in by convulsions; while delirium sometimes attends its outset in adults. On the third day, minute red specks begin to come out first on the face, then on the neck and wrists, and on the trunk of the body, and lastly, on the lower extremities. The fever usually begins to subside as soon as the eruption appears, and by the beginning of the fifth day, when the eruption is generally completed, the fever has entirely disappeared. The *second stage* commences when the eruption is fully out. Upon the second or third day of the eruption, a little clear lymph is seen in each pimple, which has increased considerably in size since its first appearance, and which is thus converted into a *vesicle*. The vesicles gradually increase in breadth, and become converted into *pustules*, which are at first depressed in the center, but by the fifth day of the eruption become turgid and hemispherical; the suppuration on the face being complete by about the eighth day from the commencement of the fever, and the same process rapidly following in the other parts of the body in the same order of succession as that in which the eruption originally appeared. The pustules then break, and scabs or crusts form over them, which usually fall off after four or five days' existence. The number of pustules in any special case and the severity of the disease, stand in a direct ratio to one another; for "the number of pustules indicates, in the first place, the quantity of the variolous poison which has been reproduced in the blood; and, in the second place, it is also a direct measure of the extent to which the skin suffers inflammation. Sometimes there are not more than half-a-dozen pustules; sometimes there are many thousands. If all these were collected into one, it would be an enormous phlegmon. For both these reasons, the system suffers commotion, distress, and peril, in proportion to the quantity of the eruption."—Watson's *Lectures*, etc., 4th ed. vol. ii. p. 857. The progress of the pustules is usually accompanied with swelling of the skin of the face, with a painful sensation of heat and tension; the scalp is often swollen; soreness of the mouth and salivation usually supervene; and the patient exhales a peculiar and disagreeable odor. About the eighth or ninth day of the disease, a recurrence of the fever, known as "the fever of maturation," sets in with varying degrees of intensity, according to the number and arrangement of the pustules. When the pustules are numerous, they run together; when they are few, they keep

separate. Hence the division of small-pox into the two great varieties of *distinct* and *confluent*, or *variola discreta* and *variola confluens*; and this division is of the highest importance, because the distinct form of the disease, in which the pustules are isolated, is scarcely ever dangerous; while the confluent form, in which they coalesce, is never free from danger. The *third or declining stage* is, in the distinct variety, little more than a period of convalescence. About the eleventh or twelfth day, the pustules on the face become brown and dry at the top, or some of them break, and the fluid which oozes out solidifies into a yellowing crust; and from this time the process of *desiccation* goes on, the swelling of the face subsides, and at last only dry scabs remain, which gradually fall off about the fourteenth day. It is not till three or four days after the scabs have formed on the face, that the same process is completed over the whole body. The scabs are usually completely gone by the twenty-first day, leaving behind them blotches of a reddish brown color, which sometimes continue for some months before they quite disappear; and some of the pustules, in consequence of ulceration of the true skin, leave pits, especially on the face, which remain permanently. The period of scabbing is accompanied by various symptoms of improvement: the tongue becomes clean, the appetite returns, and by the time that the scabs have fallen off, the patient may be regarded as restored to health; so that the entire course of a case of distinct or discrete small-pox occupies about three weeks. In the confluent form of the disease, the eruptive fever is more violent, the pain in the back is more severe, and the sickness more obstinate, and the eruption comes out earlier and less regularly than in the distinct variety which we selected for description as representing the more natural course of the disease. Moreover, the pustules do not fill so completely, nor are they of the normal yellow purulent hue, being whitish, brown, or even purple. But the most important difference between the two forms is in the *secondary fever*, which sets in when the pustules are mature. This fever, which is slightly marked in distinct small-pox, is usually intense, and highly dangerous in the confluent form; and it is at this period of the disease that death most commonly occurs. Statistics show that the eighth day of the eruption is the most perilous *day*, and the second week the most perilous *week*. The early occurrence of death—that is to say, during the first week—denotes a peculiar malignancy in the disease. “The nervous system,” says Dr. Watson, “appears to be overwhelmed by the force of the poison. During the second week, the disorder proves fatal chiefly in the way of apnoea; from some affection of the respiratory passages. After that period, the characters of asthenia commonly predominate, the patient sinks under some casual complication, or the powers of life are gradually worn out by so much irritation of the surface, and so large an amount of suppuration.”—*Op. cit.*, vol. ii. p. 860.

The above are the essential symptoms of small-pox, both in the distinct and confluent form. This disease is, however, often accompanied by other symptoms, which we have merely space to name; such as sore throat (which often depends upon pustules situated there), salivation, and (in the confluent form, during the secondary fever) erysipelatous inflammation, leading to the formation of abscesses, glandular swellings, sloughing sores on the sacrum, etc. In pregnant women, the disease often causes abortion, which is most commonly followed by death. The dead child occasionally, but not often, is covered with pustules.

The *cause* of small-pox is universally allowed to be a specific contagion, of whose nature we are in the most profound ignorance. There is probably no disease so contagious as this. Dr. Haygarth stated (in 1793) that, during his long attention to this subject, not a single instance has occurred to prove that persons liable to small-pox could associate in the same chamber with a patient in the distemper without receiving the infection; and he was informed by an American physician of an instance in which the poisonous effluvia crossed a river 1500 feet wide, and affected 10 out of 12 carpenters who were working on the other side. The contagion acts either through the air, or by contact with the skin, or by inoculation; and the disease may be caused by the dead body, even when it has not been touched. What products of the diseased body are contagious is not exactly known, but the contents of the pustules and the dried scabs certainly are so. Opinions are divided as to the period at which the disease begins and ceases to be contagious. It is safest to maintain that it is capable of self-propagation as soon as the febrile symptoms have exhibited themselves. How soon the patient ceases to be dangerous, cannot be decided with accuracy; but the stability of the contagious principle may be inferred from the fact, that clothing will retain it for months, and it is said for years, when confined. Like all the contagious exanthemata, small-pox appears in an epidemic form, at irregular, and, in our ignorance, it would almost seem capricious intervals. After an extraordinary exemption, perhaps for years, a district is suddenly invaded by it, and continues to suffer for a longer or shorter period, after which the disease spontaneously disappears—dies out, as it were—and does not reappear perhaps for years. Different epidemics vary very much in their severity, and isolated cases are usually milder than those occurring when the disease is epidemic. Race has much to do with the severity of the disease; the constitution of the dark races, the negro and the red Indian, being singularly susceptible of the contagion, and exhibiting very little power of resisting the fatal tendency of the disease.

It is universally admitted that the discovery of *vaccination* (q.v.), by which small-pox is deprived of its danger, is the greatest triumph of modern medicine. *Inoculation* (q.v.)

protected the individual, but increased rather than diminished the total number of deaths, while vaccination has the advantage of protecting both the individual and the community. Although, in the great majority of cases, vaccination affords perfect protection against small-pox, it not very infrequently happens that vaccinated persons, when exposed to the contagion of small-pox, get the disease in a modified form, milder and shorter even than after inoculation, and therefore incomparably milder than in the natural form. The disorder occurring under these circumstances has received the various names of *modified* or *post-vaccinal* small-pox, or the *varioid* disease. As Dr. Wood observes: "It is impossible to describe minutely all the shapes which the varioid disease assumes. There is every shade between the slightest symptoms, scarcely recognizable as having affinity with small-pox, and the nearest possible approach to the regular disease."—*Practice of Medicine*, 4th ed., vol. i., p. 380. In whatever form the varioid disease appears, it wants the peculiar odor of small-pox, and secondary fever is very rare. The constitutional disturbance which, for the first week, may have been as severe as in the true disease, usually subsides entirely when the eruption has reached its height, and the patient is convalescent at the period when, if he had not been vaccinated, he would have been in the greatest danger.

With regard to prognosis, it may be stated generally, it is a very fatal, and was formerly an extremely destructive disease—one death occurring in every four cases. Modified small-pox is very seldom fatal, although instances of death are occasionally reported. Small-pox is more fatal at the two extremes of life than in the intervening period, and, as has been already noticed, is especially dangerous in pregnancy. In olden times, it was believed that the eruption was an effort of nature to get rid of the noxious matter, and hence heating and stimulating measures were adopted with the view of promoting the eruption. To Sydenham (q.v.) belongs the credit of first recommending an entirely opposite or cooling mode of treatment; but his suggestions met with the most severe opposition, and it was not till long after his death that the cooling treatment was fairly established. In mild cases, and in cases of varioid disease, the physician has merely to guard the patient against hurtful influences, such as stimulating foods or drinks, too hot a room, or improper exposure to cold, and to prescribe cooling drinks during the fever, and occasional laxatives if they shall be required. In more severe cases, the fever may be combated by saline purgatives, prescribed so as to produce two or three liquid stools daily, and by free ventilation of the surface of the body. When the eruption is all out, if the pimples on the face are few and distinct, the danger may be regarded as over, and no further treatment is required. If, however, the disease assume a confluent form, wakefulness and restlessness are apt to come on about the eighth day, and opiates in free doses may be prescribed with benefit. If the pustules are abnormally torpid in reaching their maturity, it may be expedient to administer strong broths, or even wine; and when the pustules are livid, and intermixed with petecchiæ (q.v.), bark and acids must then be additionally ordered, although the patient is then too often beyond the reach of help. During the secondary fever, the bowels must be kept gently open, and opiates should be prescribed once or twice each day. A more nourishing diet is now called for, and wine should be given if the pulse is very weak. The external itching is partly relieved by the opiates, but local applications are also employed: cold cream, or a mixture of equal parts of olive oil and lime-water, may be thus used with advantage. Special methods have been devised for the purpose of preventing the pitting or seaming of the face, which is often a hideous permanent disfigurement of the patient. The best application of this kind is probably that of nitrate of silver. Mr. Higginbottom, who first suggested this application, touched each distinct papula with a solid stick of lunar caustic, previously moistened; but when the spots were confluent, he washed the whole face, about the third day after the eruption, with a strong solution of this salt, containing eight scruples to the ounce of water. In the Paris hospitals, various mercurial preparations are employed, which are said to cause the pustules to abort. M. Briquet recommends mercurial ointment, simply thickened with powdered starch. Dr. Wood of Philadelphia remarks, that as the ointment sometimes salivates, it should be diluted with an equal quantity of lard before the starch is added. Prof. Bennett of Edinburgh recommends the application of calamine (carbonate of zinc) mixed with olive oil; it forms a coherent crust, and thus excludes the air.

During the period of desquamation, an occasional warm bath may be prescribed with advantage; and the patient should always resort to this measure, as a precaution against carrying the contagion about with him, before again mixing in society.

The history of this remarkable disease is clothed in considerable obscurity. There is no evidence that it was known to the Greek or Arabian writers of the 6th c., and the first accurate description of it is that of Rhazes, an Arabian physician, who flourished early in the 10th century. It appears to have reached England toward the close of the 9th c. After the crusades it prevailed in most of the temperate countries of Europe, but did not reach the northern countries of Norway, Lapland, etc., for some time later. In 1517 it was carried from Europe to St. Domingo; and three years later, it reached Mexico, where it committed fearful devastations, and whence it spread with intense virulence throughout the new world. (According to Robertson, three millions and a half of people were destroyed in Mexico alone.) In 1707, it was introduced into Iceland, when more than a fourth part of the whole population fell victims to it; and it reached Greenland still la-

ter (in 1733), when it spread so fatally as almost to depopulate the country. These cases are striking illustrations of the law that seems universally true, that a contagious disease is always most virulent on its first introduction to a new scene of action.

SMALL-POX IN SHEEP, *Variola ovina*, although resembling the small-pox of men, is a distinct disease, not communicable either by contagion or inoculation to men or children, or even to dogs or goats. Although common on the continent of Europe, it was unknown in Gt. Britain for at least a century, until in 1847 it appeared in Norfolk and the eastern counties, and in the summer of 1862 in Wiltshire near Devizes. Variolous sheep or infected skins appear in both cases to have imported the disease from abroad. About ten days after exposure to contagion, the infected sheep become feverish, have a muco-purulent nasal discharge, and a hot, tender skin. The red pimples which first appear, in about three days become white, and afterward leave scabs or ulcers. The weakness is great, and the mortality varies from 25 to 90 per cent. Good food and nursing are the appropriate remedies.

SMALLS, ROBERT, b. Beaufort, S. C., 1839, a slave, but managed to educate himself in a limited degree. In 1851 he began a seafaring life; became connected with a Charleston steamer, and delivered her to the commander of the U. S. blockading squadron, 1862. He was made a pilot in the union service, and was promoted to capt., 1863; was a member of the S. Car. constitutional convention, 1868, and of the state legislature, 1868, and state senate, 1870-74; was appointed maj.-gen. of state militia; was a repub. representative in congress, 1875-79 and 1881-87.

SMALLWOOD, WILLIAM, about 1732-92; b. Md.; in the revolution commanded a Maryland battalion; was present at White Plains, in Sullivan's Staten Island expedition, and at the battle of Germantown. He refused to serve under baron Steuben, and left the army with the rank of maj.-gen. In 1785 he was elected to congress, and was governor of his native state, 1785-8.

SMALT, a name applied to the colored glass compositions used for making the tesserae employed in forming mosaics. See also **COBALT**.

SMART, BENJAMIN HUMPHREY, b. England 1785; a teacher of elocution in London. He was considered an authority upon English orthoepy, and was a voluminous writer on many topics. Among his works may be mentioned *Grammar of English Pronunciation* (1810), *Grammar of English Sounds* (1813), and a *Pronouncing Dictionary* (1836), founded upon Walker's. He died 1872.

SMART, CHRISTOPHER, 1722-71; b. Kent, England, educated at Cambridge, where he took the Seatonian prize for poetry 5 years in succession. In 1753 he came to London and endeavored to make a living by his pen. He translated the Psalms, Horace, and Phædrus, into English verse, and made a prose translation of Horace. His original poems show considerable talent, and were published in collected form. He became insane through dissipation and deprivations, and died in a debtor's prison.

SMART-MONEY. See **RECRUITING**.

SMARTWEED. See **POLYGONÆÆ**.

SMEATON, JOHN, an eminent civil engineer, was b. at Austhorpe, near Leeds, in 1724, and early showed a bent toward mechanical pursuits. At the age of 15, he had constructed a machine for rose-engine turning. About 1750, he removed to London, to commence business as a mathematical instrument maker; but we find him in the following year resuming his desultory experiments in mechanical invention; an "odometer" for ships, a compass, and improvements in water and wind-mill machinery, being the chief products of his inventive genius. His improvements on mill-work were found on trial to be of great value, increasing the effective force by one-third, and gained Smeaton the Copley medal of the royal society in 1753. In 1753, he was chosen a member of the royal society; and in the following year, to extend his practical acquaintance with engineering, he visited the Netherlands, and inspected the embankments, canals, and other remarkable works of that country. In 1755, an event occurred which was to afford him the opportunity of attaining the very summit of his profession—the second wooden light-house on Eddystone rock was destroyed by fire in December. The speedy re-erection of another beacon was of the utmost importance, and the execution of the work was intrusted to Smeaton. The new light-house was built of stone; the cutting of the rock for the foundations commenced in Aug. 1756, the building was executed between June 1757, and Oct. 1759, and the lantern lighted on Oct. 16 of the latter year. This great work, the greatest of its kind hitherto undertaken, remained 120 years a stable monument of Smeaton's engineering skill. Yet he seems to have had little employment for some time subsequently, as he applied for and obtained in 1764 the post of "receiver of the Derwentwater estate," the funds of which were applied for the behoof of Greenwich hospital; and this situation he held till 1777, by which time he was in full professional employment. The chief of his other engineering works were the construction of the greater portion of Ramsgate harbor (1744); the laying out of the line of the Forth and Clyde canal, and the superintendence of the excavation of most of it: the rendering of the Calder (Yorkshire) navigable; the erection of Spurn light-house, and of several important bridges in Scotland; together with an immense amount of mill-machinery. He also greatly improved Newcomen's steam engine, but the mighty achievements of Watt in the same field threw his labors completely into the shade. He is said to

have prevented the fall of the old London bridge for many years by sinking a great quantity of stones around one of the piers, which had become undermined by the strength of the Thames current. In 1783, his health began to decline, and he retired from active business, dying at Aushorpe of paralysis, Oct. 28, 1792. He was one of the chief promoters of the "Society of Civil Engineers," which was started in 1771, and after Smeaton's death published (1797), in three 4to volumes, his numerous professional reports, which were regarded by his successors "as a mine of wealth for the sound principles which they unfold, and the able practice they exemplify." For a large portion of his life Smeaton was in constant attendance on parliament, which, in difficult or important engineering schemes invariably demanded, and almost always followed his advice—a proof not only of his eminence in his profession, but of his caution, judgment, and integrity. See the biography prefixed to his "Reports."

SMEE, ALFRED, b. England, 1818; member of the college of surgeons, 1840; fellow of the Royal Society, 1841; lecturer to the Aldersgate street school of medicine, surgeon to the bank of England, senior surgeon to the royal general dispensatory; a thorough student of electricity. He invented the Smee *voltæic battery* and the method by which the bank of England notes are printed. S. was a conservative politician, and author of numerous works on physiology, electricity, etc. He d. 1877.

SMELL. See NOSE.

SMELLIE, WILLIAM, 1740-95; b. Edinburgh Scotland; became a printer, educated himself, and in 1759 was editor of the *Scots Magazine*. In 1771, then being a publisher, he issued the first edition of the *Encyclopædia Britannica*, many of the articles being written by himself. From 1773 to 1776 he was joint editor with Gilbert Stuart of the *Edinburgh Magazine and Review*. He was the author also of *The Philosophy of Natural History* (1790-99), which was reprinted in this country.

SMELT, *Osmerus*, a genus of the salmon or trout family (*salmonidæ*), of which only a few species are known, differing from the salmon, trout, etc., in having long conical teeth on the jaws and tongue, and on the tip of the vomer, the rest of the vomer being destitute of teeth; two distinct rows of teeth on each palatine bone.—The COMMON SMELT (*O. eperlanus*), called *spirling* or *spurling* in Scotland, and *eperlan* in France, is a fish of 8 or 10 in. (rarely 12 in.) in length. The form is very trout-like—rather more slender—the tail larger in proportion and more forked. The lower jaw is much longer than the upper. The scales are small; the back is whitish, tinged with green; the upper part of the sides shows bluish tints, the lower part of the sides and the belly are of a bright silvery color. The smelt has a peculiar cucumber-like smell and a delicious flavor, on account of which it is highly esteemed for the table, where it often appears as an accompaniment of other fish. The smelt is partly an inhabitant of fresh water, and partly of the sea. It ascends rivers to no great distance from the sea in autumn, and descends in spring. Great numbers of smelts are taken in estuaries and near the mouths of rivers by small-meshed nets. They are also taken on the open sea-coast, chiefly on low sandy shores as that of Lincolnshire. The attempt has been successfully made to keep the smelt continually in fresh-water ponds, in which it not only thrives well without loss of flavor, but propagated abundantly. No effort has yet been made to turn this discovery—not a very recent one—to any economical account. Although found both on the eastern and western coasts of Britain, the smelt is unknown on the s. coast of England, where the name smelt or SAND SMELT is given to the atherine (q.v.).—Another British species, the Hebridean smelt (*O. Hebridicus*), was first discovered near Røthésay in 1837 and described by Yarrell. It is so rare as to be unimportant.—The AMERICAN SMELT (*O. viridescens*) is regarded as distinct from the common smelt. It has a longer body and a greener back. It is found on the north-eastern coasts of America as far s. as the Hudson.

SMELTING. See IRON.

SMERDIS, the younger son of Cyrus, put to death secretly by the order of his brother Cambyses, who was jealous of him. The governor of the palace having a brother strikingly resembling the murdered prince, set him up as the true Smerdis, and on the death of Cambyses had him proclaimed king. Some of the Persian nobles soon suspected the cheat, and were satisfied of it when they found that the false Smerdis had no ears. Seven nobles then entered the palace and killed the pretender after he had reigned seven months. After this Darius Hystaspes was chosen king B.C. 521.

SMET, PETER JOHN DE, 1801-72; b. Belgium; educated at Mechlin; came to the United States in 1831; entered the Jesuits' novitiate at Whitmarsh, Md.; was one of the founders of the university of St. Louis; superintended missions among the Pottawottamie and Flathead Indians in 1840, and had great influence over the tribes. He published *Oregon Missions*; *Western Missions and Missionaries*; *Letters, Sketches, and Residence in the Rocky Mountains*.

SMETANA, FRIEDRICH (1824-84), a Bohemian composer and pianist, pupil of Franz Liszt. From 1866 to 1874 he was conductor at the National theater in Prague, resigning on account of deafness. He wrote the operas, *Married for Money*, *The Brandenburger in Bohemia*, and the *Bartered Bride*, which last attracted much attention in Vienna in 1892.

SMEW, *Mergellus albellus*, a bird of the family *scoliadæ*, very nearly allied to the goosander and mergansers, but having a shorter bill. The whole length of the male is not quite 18 in.; that of the female, not quite 15. The smew is only known in Britain as a winter visitant, appearing in greatest numbers in severe winters, and sometimes on inland lakes and ponds, as well as on the sea-coast. It abounds on the northern coasts of Asia, and in some parts of continental Europe.

SMILACEÆ, a natural order of exogenous plants, ranked by Lindley in his class dictyogens (q.v.), and consisting of herbaceous or half-shrubby plants, generally more or less climbing, with reticulated leaves, and bisexual or polygamous flowers, a 6-parted perianth, six stamens, a free 3-celled ovary, with cells one or many seeded, three stigmas, and a roundish berry. There are about 120 known species, mostly of the genus *Smilax*, scattered over the globe, but most numerous in the temperate and tropical parts of Asia and America. The root stocks (*rhizomes*) of many species yield sarsaparilla (q.v.). But some species have fleshy tubers, particularly *Smilax China*, a native of China and Japan, the tubers of which are very large and nutritious and used for food. *Smilax pseudo-China*, an American species, has similar tubers.—The roots of *Roxburghia viridiflora*, after being boiled and soaked in lime-water to remove their acidity, are preserved in syrup as an article of food in the Eastern peninsula and Malayan Islands. The stems of this plant are sometimes 100 fathoms long. See **SMILAX**.

SMILAX. A kind of endogenous and sometimes prickly plants that climb by tendrils. It is found in warm climates, and several species are found in the eastern part of the United States, among them the greenbriar or catbriar (*Smilax rotundifolia*), which is found from Canada to the Southern states, spreading over shrubs and trees, its stems extending sometimes to a length of 40 feet. It is a favorite decoration for houses combined with various flowers. See **SMILACEÆ**.

SMILES, SAMUEL, b. Scotland, 1812; educated as a physician, but practiced a short time only. He was editor of the *Leeds Times*; in 1845 became connected with railway management, and continued in this until 1866. He has written many biographical and didactic books, such as the *Life of George Stephenson* (1858); *Self-Help* (1860), which attained a large circulation; and *Duty* (1880). His works are prized for practical moral and social lessons.

SMILLIE, GEORGE H., b. New York, 1840; son of James, the landscape engraver; studied painting with James M. Hart; opened a studio in 1862; exhibited for the first time, 1864. His "Sunny Brook Farm" brought him into notice, and he became an academician of the National Academy of Design in 1882. His favorite subjects are scenes from the Adirondacks and White Mountain views.

SMILLIE, JAMES D., b. New York, 1833; employed by the American bank-note company as engraver until he went to Europe in 1862 to study painting. He became a member of the National Academy in 1865, having been associated with his brother George H. for the year previous. One of his most attractive pictures is "Ausable Lake," in the Adirondacks. He illustrated Bryant's poem, *Among the Trees*, with 22 plates.

SMIRKE, SIR ROBERT, 1780-1867; b. England; began to practice his profession as an architect in London in 1805. Among his works in the classic style are the College of Physicians, the Post-Office, the Mint, and the British museum; in the Gothic style, the extension of the Inner Temple, and the restoration of York minster. He published *Specimens of Continental Architecture* (1806).

SMIRKE, SYDNEY, b. England in 1799; brother of Sir Robert, and himself an architect. His most important works are the Oxford and Cambridge University club, Pall Mall front, restorations in the Temple church, 1842. Peel's portrait gallery at Drayton manor, the Carlton club, and (in connection with Mr. Panizzi, the librarian) the great British Museum reading-room, of which the dome has a diameter but two ft. less than that of the Roman Pantheon. He d. 1877.

SMITH, a co. in n. Kansas, adjoining Nebraska; drained by Solomon river and several creeks; pop. '90, 15,613, chiefly of American birth. The surface, a rolling prairie, affords excellent pasture land; wheat, corn, and oats are staples. Area, 900 sq. m. Co. seat, Smith Centre.

SMITH, a co. in central Mississippi, drained by Strong and Leaf rivers; 630 sq. m.; pop. '90, 10,635. The surface is nearly level, with large forests of oak, pine, magnolia, and other trees; the soil is poor and sandy. The main productions are cotton, rice, Indian corn, sweet potatoes, and wool. Sheep and swine are raised in large numbers. Co. seat, Raleigh.

SMITH, a co. in n. Tennessee, intersected by Cumberland river and Caney fork; 368 sq. m.; pop. '90, 18,404. Co. seat, Carthage.

SMITH, a co. in n.e. Texas; drained by the Sabine river, its n. boundary, and by the Neches and Angelina; area, 930 sq. m. Pop. '90, 28,324. Co. seat, Tyler.

SMITH, ADAM, the founder of political economy as a separate branch of human knowledge, was b. in the town of Kirkcaldy, in Fifeshire, on June 5, 1723. His family belonged to the respectable middle class of Scotch life; his father was comp-

troller of the customs of the port of Kirkcaldy, and his mother, Margaret Douglas, was the daughter of a small Fifeshire laird. His father died a short time before his birth, and he was the object of the care and solicitude of a widowed mother, to whom he was closely attached, and who long lived to be proud of his attainments. When he was no more than three years old, the poor woman got a sad fright, from a calamity hardly known at the present day—the child was stolen by gypsies; but he was tracked and recovered by his uncle as they were seeking a hiding-place in the neighboring wood of Leslie. This was the only adventure in his quiet life. After getting the usual burgh-school education in Kirkcaldy, he was sent, in 1737, to the university of Glasgow. He there secured an exhibition on the Snell foundation, which took him to Balliol college, Oxford. He studied there for seven years, and left traditions as of a man of large acquirements and peculiar independence of thought. It is said that he was intended for the English church, but if so, his own convictions crossed the designs of his friends. He returned to Kirkcaldy, and lived for a while with his mother there in undisturbed seclusion and study. It was said to be his practice to stand ruminating, with his back to the fire, and his head leaning against the chimney-piece—and over an old fireplace in Kirkcaldy it used to be shown how he had thus worn a piece off the paint. In 1748 he came to Edinburgh, where silently and unostentatiously he became one of the brilliant little circle of men of letters who were then rising to importance. In 1751 he got the chair of logic in the university of Glasgow, and this was changed a year afterward for that of moral philosophy. In 1759 appeared his *Theory of Moral Sentiments*; celebrated for its reference of the mental emotions to the one source of sympathy. The *Dissertation on the Origin of Languages* was published along with the later editions of this book. Both had a great reputation in their day, and although they are now among obscure books in comparison with that other by which the author's name is remembered, the position they held with respectable thinkers gave a hearing to his doctrines on political economy which they would hardly have otherwise obtained. In 1762 the university of Glasgow gave him the degree of doctor of laws. In the following year he undertook a task, which might at first seem very uncongenial to a mind like his, given to retired study and independent thought and action. He became "governor" or traveling tutor to the young duke of Buccleuch. He was then sedulously collecting materials for his great work, and no doubt the inducement to accept of the office was the opportunity it gave him for traveling and seeing for himself. He had the opportunity of being nearly a year in Paris, and of mixing in the circle of renowned wits and philosophers of the reign of Louis XV. In 1766 his function came to an end, and he returned to Kirkcaldy to live in the old house with his mother. The year 1776 was an era in the history of the world as well as that of the Kirkcaldy recluse, in the appearance of the *Inquiry into the Nature and Causes of the Wealth of Nations*. If there was any living man to whose works he was indebted for the leading principles of this book, it was David Hume, and it was from him, as best understanding the fullness and completeness of the exposition, that it had its first emphatic welcome. He wrote immediately on receiving it: "EUGE BELLE.—DEAR MR. SMITH—I am much pleased with your performance; and the perusal of it has taken me from a state of great anxiety. It was a work of so much expectation by yourself, by your friends, and by the public, that I trembled for its appearance, but am now much relieved. Not but that the reading of it necessarily requires so much attention, and the public is disposed to give so little, that I shall still doubt, for some time, of its being at first very popular. But it has depth, and solidity, and acuteness, and is so much illustrated by curious facts, that it must at last take the public attention." This was not destined to be exactly the literary history of this great work. Its startling doctrines, fine clear style, and abundant illustration from curious facts took at first; but counteracting influences arose when people saw how far the new doctrines went in playing havoc with old prejudices. The French revolution set the minds of the English bigoted against everything that breathed of innovation. It was known that the younger Pitt participated at first in Smith's free-trade notions, but he had afterward, whether from permanent connection or temporary policy, to put himself in the foremost ranks of the enemies of innovation. It was not until long after the terrors of that epoch and the nervous vicissitudes of the war had passed over, that Smith's work had an opportunity to revolutionize the public mind on matters of trade and finance. It came up, as it were, the leader of a great literary host, for expounders had crowded in numbers round *The Wealth of Nations* as the text-book of sound economy. Of a book so well known and so much read it is needless to speak. The only reproach brought against it is that it is not systematic in its form, and that its nomenclature is not exact. But its author was not arranging the results of established knowledge—he was rather pulling down existing structures, compounded of ignorance and prejudice. Nor, indeed, have those who have attempted to make an exact science out of political economy practically vindicated the reproach they have cast on him of being unmethodical. Whatever we may yet come to, very few portions indeed of political economy admit of being treated as exact science. It is too closely connected with human passions and energies, and consequently with special results and changes, to be so treated; and the best books on the subject are still characterized by the discursiveness and mixed philosophy and fact of the *Wealth of Nations*. In 1778, Smith was made a commissioner of customs. The only effect of this was to bring him to Edinburgh, and increase his means for indulging in his favorite weakness, the collection of a

fine library; for he was, as he called himself, a "beau in his books." In 1784 he suffered that affliction which was sure to come if he lived long enough for it—the loss of his worthy mother. He followed her six years afterward, dying in July, 1790.

SMITH, ALBERT, 1816–60; b. England; a surgeon, who settled in London in 1841, and became a regular writer for the press, including *Bentley's Miscellany* and *Punch*. He ascended Mont Blanc in 1851, and his "entertainments" on that subject were successful for some years. He also went to China, and on his return gave a Chinese "entertainment." His *Story of Mont Blanc* appeared in 1853; *To China and Back*, in 1859.

SMITH, ALEXANDER, poet, was b. at Kilmarnock, in Ayrshire, Dec. 31, 1830; received, as a boy, a fair English education, and passed from school into a Glasgow warehouse as a pattern designer. While following this occupation, he began to write poetry. His first volume entitled the *Life Drama*, was published in 1853, and created something like a furore in literary circles. A reaction, however, followed, and the author had scarcely found himself famous when he began to be abused. The faults of his book were obvious enough; every page contained evidence of immaturity, and its natural result, extravagance; while a rather narrow reading having made him passionately attached to a few modern poets, as Keats and Tennyson, their peculiar turns of expression reappeared in his verse, and gave color to the charge of plagiarism, which was pushed to an absurd length. But impartial critics were not slow to perceive a richness and originality of imagery that more than atoned for all defects of taste and knowledge. In 1854, Smith was appointed secretary to the university of Edinburgh; and in the following year, along with Sydney Dobell (q.v.), produced a volume of *Sonnets on the War*. He afterward wrote *City Poems* (1857), *Edwin of Deira* (1861), and several prose works, as *Dreamthorp* (1863), *A Summer in Skye* (1865), and *Alfred Hagart's Household* (1866). Smith was perhaps not less distinguished as a writer in prose than in verse, his prose style being marked by picturesqueness, polish, and originality. He died in 1867.

SMITH, ANDREW JACKSON, b. Penn., 1815; graduated at West Point. Before the war of the secession he served on the frontier against hostile Indians; col. 2d California cavalry, 1861; brig.-gen. vols., 1862. He was chief of cavalry in Missouri and Mississippi, in the army of the Tennessee, and in the Yazoo expedition; and was at Chickasaw Bluffs, the capture of Jackson, and the capture of Mobile. He was mustered out of the volunteer service in 1866, and retired from the regular army, 1869. For gallantry in Mississippi and Tennessee, brevetted col., brig.-gen., and maj.-gen. Jan. 22, 1889, he was reappointed colonel of cavalry, and simultaneously placed on the retired list.

SMITH, ASA DODGE, D.D., LL.D., 1804–77; b. Mass.; graduated at Dartmouth college in 1830, and at Andover theol. seminary in 1834; pastor of Fourteenth street Pres. church, New York, 1834–63; became president of Dartmouth college in 1863; resigned in 1877, and died in Hanover the same year. He published *Letters to a Young Student*; *Importance of a Christian Ministry*; *The Puritan Church's Stewardship*, and other sermons. During his pastorate in New York he was one of the most prominent and successful ministers of his denomination in that city; and his presidency of Dartmouth was notable for the good work done in the college and its associated schools, and for the large amounts of money secured for it through pres. Smith's influence.

SMITH, AZARIAH, 1817–51; b. N. Y.; graduated at Yale college in 1837; studied medicine; studied theology at New Haven in 1839, and took medical degree; sailed 1842 as a missionary of the American board for the Levant; traveled extensively in Asia Minor; settled in Aintab in 1848. He contributed papers on meteorology and Syrian antiquities for Silliman's *Journal of Science*.

SMITH, BENJAMIN BOSWORTH, b. R. I., 1794; studied at Brown university; ordained, 1818; consecrated bishop of the Protestant Episcopal diocese of Kentucky, 1832. He was the editor of the *Episcopal Register*, of Vermont, 1827, of the *Episcopal Recorder*, Philadelphia, 1829. He was the senior bishop of his church at the time of his death in 1884.

SMITH, BUCKINGHAM, 1810–71; b. Ga.; graduated at Harvard law school 1836; practiced for a time in Maine, but in 1850 was made *chargé d'affaires* in Mexico. From 1853 to 1859 he was secretary of the Madrid legation. He published several books and papers on the conquest of Florida, De Soto's discoveries, and kindred topics.

SMITH, CHARLES FERGUSON, 1807–62; b. Penn.; graduated at West Point and served with distinction through the Mexican war. During the war of the secession he was in the federal army, in which he rose to be maj.-gen. He was for some time commander of the federal forces in Kentucky, and led the decisive charge at fort Donelson.

SMITH, DANIEL, about 1740–1818; b. Va.; one of the first settlers of Tennessee, and a revolutionary patriot. After the war he held several local offices, was member of the Tennessee constitutional convention, and U. S. senator, 1793–99 and 1806–09. In 1799 he published the first map of the state.

SMITH, EDMUND KIRBY, b. Fla., 1824; graduated at West Point, 1845; served with distinction in the Mexican war and afterward taught at the academy. He resigned in 1861 with rank of major, and entered the confederate army, serving as brig.-gen. under

Johnson, and heading the fresh troops which decided the battle of Bull Run. In 1862 he was made lieutenant-general. In 1863 he was with the Mississippi army, and surrendered to Gen. Canby in 1865. He became professor of mathematics in the university of the South at Sewanee, Tenn., where he died, March, 1893.

SMITH, EDWARD P., 1827-76; b. Conn.; educated at Dartmouth and Yale colleges and the theological seminary of New Haven; pastor for several years of the Congregational church at Pepperell, Mass.; was field-secretary of the U. S. Christian commission during the secession; after the war general agent for the American missionary association in the southern states; appointed U. S. commissioner of Indian affairs, 1873; went to Africa 1875, to visit the missions of the American missionary association; reached the river Gambia, where he died. He published *Incidents of the United States Christian Commission*. He had excellent administrative ability, and earnest Christian philanthropy.

SMITH, ELI, D.D., 1801-57; b. Conn.; graduated Yale college 1821; left Andover theol. seminary 1826, and went as a missionary of the American board to Turkey; made a missionary tour, 1829, through Greece; again through Armenia and Georgia to Persia, which opened the way for a mission to the Nestorians; made with Dr. Robinson, 1837, a tour in Egypt and Palestine, ably aiding his researches in Biblical geography. A good classical and Hebrew scholar, he acquired also French, Italian, German, and Turkish; and Arabic was to him a second vernacular. He prosecuted with zeal every collateral study in order to qualify himself for what he considered his great work, a faithful translation into Arabic of the word of God. He drew for himself after careful study of the art, with utmost accuracy, models of type, and superintended the cutting, casting, and perfecting of the fonts. An account of his tours was published in two vols.

SMITH, ELIZABETH OAKES (PRINCE), b. 1806, Cumberland, Me.; descendant of gov. Prince of the Plymouth colony and pres. Urian Oakes of Harvard university; removed in infancy to Portland, Me.; married Seba Smith, an editor, while quite young, and wrote prose and verse, and assisted her husband in his profession. In 1839, meeting with financial reverses, she adopted literature as a means of subsistence, and settled in New York in 1842, contributing to the magazines and reviews, corresponding for papers, writing stories, plays, and lectures. She removed to North Carolina, 1876. She published *Woman and her Needs*, 1851. She died, 1893.

SMITH, FRANCIS HOPKINSON, an American landscape painter and author, born at Baltimore, Md., Oct. 23, 1838. He is by profession an engineer, and has built many public works, under contract with the United States, among others, the Race Rock light-house, off the harbor of New London (1871-77), and the Block Island breakwater (1879). As a painter he is self-taught, and won a wide reputation for his effective work in water-colors and charcoal. Among his best known water-colors are, "In the darkling Wood" (1876); "Peggoty on the Harlem" (1881); "Under the Tower, Brooklyn Bridge" (1883); and "A January Thaw" (1887). His water-colors of Venetian scenes have also been much admired for their free and clever treatment. He is also well-known as a book and magazine illustrator, and as the author of *Well-worn Roads* (1886); *Old Lines in new Black and White* (1886); *A Book of the Tile Club* (1887); *Tom Grogan* (1896); *Gondola Days* (1897). He is a member of the American water-color society, and was its treasurer during 1875-78.

SMITH, GEORGE, 1840-76; b. England; in 1866, while examining the Assyrian paper casts in the British museum, discovered an inscription of Shalmaneser II. concerning the war against Hazael; in 1867 aided in preparing a volume of cuneiform inscriptions, and from that time devoted himself to the study of them. Among his earlier discoveries are: a notice of an eclipse, 763 B.C.; of several kings of Israel; of conquest of Babylonia, 2280 B.C.; of Chaldean account of the deluge; in 1871 published a work giving the texts, transcriptions, and translations of documents pertaining to Asshur-bani-pal (Sardanapalus). In 1873-74 he went twice to Nineveh, obtaining 3,000 inscriptions and many other important acquisitions; in 1876 went again to the east and died while exploring the Euphrates valley. In knowledge of Assyrian texts he was unequalled.

SMITH, GERRIT, 1797-1874; b. N. Y.; graduated at Hamilton college in 1818. Being heir to one of the largest properties in the country, his time was occupied chiefly in its care; but he was admitted to the bar in 1853, and practiced to some extent. He was prominent in benevolent undertakings, and associated himself with organizations such as the American colonization society and the American anti-slavery society from an early period. His personal liberality was great, and he divided more than 200,000 acres of land in free gifts, partly among public institutions, but also largely in small parcels of about 50 acres among poor persons, black and white. He also gave large sums in aid of emancipation. He was a member of congress in 1852, and there and everywhere gave the freest vent to his pronounced opinions in favor of liberty of speech, conscience, and the person.

SMITH, GOLDWIN, LL.D., son of a Berkshire physician, was b. at Reading in 1823. He received his education at Eton and Oxford. In 1847 he was elected fellow of University college, where he officiated for a time as tutor. In the same year he was called to the bar at Lincoln's Inn. The ministry of the day availed themselves of Mr. Smith's services in carrying out their plans of university reform. He was nominated assistant-

secretary to the first, and secretary to the second Oxford commission, by which the somewhat antiquated statutes of the university were reconstructed, and the rich endowments of the colleges opened to public competition. Mr. Smith was also a member of the popular education commission appointed in June, 1858. He held the chair of modern history in Oxford, 1858-66. In 1868 he was elected to the chair of English and constitutional history in Cornell university, Ithaca, N. Y. He has lately resided in Canada. Goldwin Smith has long been known as a publicist of the highest class, and has completely identified himself with the more advanced school of reformers. During the American war he was an earnest defender of federal interests, and combated with success in the *Daily News* and elsewhere, the singular theories of the rights of slavery and the duties of neutrals, which were then somewhat fashionable. He was also active in denouncing the Jamaica massacres, and in advocating an extended measure of reform. Mr. Smith's writings are characterized by great extent and accuracy of information, by a style singularly vigorous and condensed, and by great powers of sarcasm. Among his principal publications may be enumerated: *Irish History and Irish Character*; *Lectures on Modern History, with a Supplementary Lecture on the Doctrine of Historical Progress*; *The Empire*, a reprint from the *Daily News* of 1862-63; *England and America*, a lecture delivered before the Boston fraternity, and reprinted from the *Atlantic Monthly*; several pamphlets on the American question; contributions to Oxford essays; *A Short History of England*; etc. He wrote also *Conduct of England to Ireland* (1882); *Canada and the Canadian Question* (1890); *History of the United States* (1893); *Bay Leaves*; *Translations from the Latin Poets*; *Specimens of Greek Tragedy*; and *Essays on Questions of the day* (1894).

SMITH, GREEN CLAY, b. Ky., 1832; educated at Transylvania university. He was a volunteer in the Mexican war, practiced law in Kentucky, of whose legislature he was a member, served in the federal army, 1861-63, and rose to be brig.-gen. He was afterward member of congress and governor of Montana. He died June 29, 1895.

SMITH, HENRY BOYNTON, D.D., LL.D., 1815-76; b. Me.; graduated at Bowdoin college in 1834; was tutor in Greek and librarian 1836-37 and 1840-41; studied theology at Bangor and Andover, Halle, and Berlin. In Germany he was honored by theologians for his learning. In 1842 he became pastor of the Congregational church, West Amesbury, Mass., filling also for two years in connection with his pastoral duties the chair of Hebrew in Andover seminary; was professor of mental and moral philosophy at Amherst college, 1847-50; of church history in Union seminary, 1850-55; and of systematic theology, 1855-73, when enfeebled by unremitting toil he retired from the chair though retained as emeritus professor of apologetics until his death. His publications are: *The Relations of Faith and Philosophy*; *Nature and Worth of the Science of Church History*; *Problem of the Philosophy of History*; *The Reformed Churches of Europe and America in Relation to General Church History*; *The Idea of Christian Theology as a System*; *History of the Church of Christ*; *Chronological Tables*. He edited for many years *The American Theological Review*, and contributed largely to the *Bibliotheca Sacra* and other reviews. He had brilliant scholarship, a fervid and deeply spiritual nature, a gentle and winning disposition; and especially in church history his work has enduring value.

SMITH, HOKE, was born in North Carolina in 1855, receiving there his early education. In 1876 he took up his residence in Atlanta, Ga., where he began the practice of law with much success. He became part proprietor of the *Atlanta Journal*, and in 1892 was President of the Board of Education. In 1893, he was appointed Secretary of the Interior by President Cleveland.

SMITH, ISAAC, 1736-1807; b. N. J.; graduated at Princeton, 1755; was tutor there; studied medicine; col. of a regiment, 1776, in the patriot army, and was distinguished for his patriotism throughout the war. At its close he was appointed judge of the supreme court of New Jersey, holding the office 18 years. He was a member of congress, 1795-97; treated with the Seneca Indians as U.S. commissioner under Pres. Washington, 1797; president of the bank of Trenton, 1807.

SMITH, ISRAEL, 1759-1810; b. Conn.; educated at Yale college, and settled in Vermont, where he was elected to the legislature. He was a member of congress, 1791-97 and 1801-3; chief-justice of the state supreme court in 1797, and U. S. senator, 1803-7. He was a member of the convention that adopted the federal constitution, and was active in securing the admission of Vermont as a state.

SMITH, JAMES, 1737-1812; b. Penn.; captured and adopted by the Indians in 1759, but afterward escaped. He was a lieutenant in Bouquet's expedition in 1764; a col. in the revolutionary war, and afterward a member of the Kentucky legislature. He wrote *Remarkable Occurrences in the Life and Travels of Col. James Smith* (1799).

SMITH, JAMES and HORACE, authors of *The Rejected Addresses*, were sons of an eminent London solicitor. James was b. Feb. 10, 1775, d. Dec. 24, 1839; Horace was b. Dec. 31, 1779, d. July 12, 1849. James followed his father's profession, and succeeded him as solicitor to the board of ordnance; Horace adopted the profession of a stock-broker, and realized a handsome fortune, on which he retired with his family to Brighton. Both were popular and accomplished men—James remarkable for his conversational powers and gayety, and Horace (the wealthier of the two) distinguished for true liberality and benevolence. The work by which they are best known is a small volume of poetical parodies or imitations, perhaps the best in the language. On the

opening of the new Drury Lane theater in Oct. 1812, the committee of management advertised for an address to be spoken on the occasion, and the brothers Smith adopted a suggestion made to them, that they should write a series of supposed "Rejected Addresses." They accomplished their task in the course of a few weeks—James furnishing imitations of Wordsworth, Southey, Coleridge, Crabbe, Cobbett, etc.; while Horace contributed imitations of Scott, Byron (all but the first stanza), Monk, Lewis, Moore, and others. In point of talent, the authors were about equally matched; for though James had the greater number of successful imitations, the one by Horace of Scott, is the most felicitous of the whole. It is a curious fact in literary history that a work so exceedingly popular should have had great difficulty in finding a publisher; and that the copyright, which had been originally offered to Murray for £20, and refused, was purchased by him in 1819, after the book had run through 16 editions, for £131. The authors received above £1000 from the sale of the work. James was afterward an occasional contributor to the periodical literature of the day, and author of the humorous theatrical entertainments of Charles Mathews (for which he received £1000). Horace Smith wrote several novels—*Brambletye House*, *Tor Hill*, etc.

SMITH, JEREMIAH, LL.D., 1759–1842; b. Peterborough, N. H.; graduate of Rutgers college, 1780; distinguished as a lawyer and a scholar; member of congress, 1791–97. He was governor of New Hampshire, 1809–10, chief-justice of the superior court for several years, and intimate friend of Daniel Webster. He published *Sketch of the Character of Judge Caleb Ellis*.

SMITH, JOHN, 1579–1632, b. at Willoughby, Lincolnshire, England. He was left an orphan at an early age, and his guardians permitted him to indulge the roving spirit which distinguished him. At the age of fifteen he accompanied the sons of an English nobleman on a tour of the continent as a page. But he soon left them and enlisted under the Protestant banner in France. He served as a soldier of fortune in different lands, and, according to the memoirs which he published of his life, met with a series of wonderful and romantic adventures. The coloring of romance, however, with which the narrative is imbued is too vivid to appear entirely trustworthy, and contradictions have been discovered in some of his statements. The most remarkable of these records is the account of his victory over three Turks, whom he asserts he slew in single combat under the walls of Regall, in Transylvania. For this achievement he claims to have been ennobled by the ruler of that realm, receiving a patent of nobility (which he publishes in the original Latin) empowering him to emblazon upon his shield the bleeding heads of three Turks—a privilege of which he does not appear to have availed himself. Having returned to England he was induced to take part in the colonization of Virginia, and sailed with the vessels fitted out for this purpose in 1606. He was named a member of the council to direct the affairs of the infant community in the secret list prepared before the departure of the fleet, but during the voyage he was imprisoned on a charge of sedition. On the arrival of the vessels, when the list was examined, he was not allowed to take his seat; he indignantly demanded an immediate trial, which was finally accorded. He established his innocence, but the jealousy of his comrades still excluded him from his seat. But his military reputation, his fiery spirit, tempered by prudence and sagacity, soon made his influence felt, and his advice was often sought by the authorities. With rare magnanimity, considering the injustice with which he had been treated, he did not refuse his assistance. He was sent on several expeditions for forage and discovery among the Indians, and distinguished himself by the ability with which he conducted them. It was on one of these occasions, in Dec., 1607, that Smith was captured by the Indian chief whom in his narrative he calls Powhatan. The story which he relates of the young Indian maiden, Pocahontas, who, when he was condemned to death by the savage chieftan, saved his life by her interposition, has been discredited in many of its details, though there can be no doubt that such a woman lived and was married to an Englishman of the name of Rolfe. Her blood flows in the veins of some distinguished Virginian families. Mr. Charles Deane, in his notes to Wingfield's *Discourse of Virginia* (Boston, 1859) was the first to throw doubts on the truth of this celebrated romance. Smith's influence became paramount in the little settlement, which was called Jamestown, after the reigning monarch. He was elected president of the council, Sept. 1608, and several times saved the colony from ruin by his decision, sagacity, and force of character. In his dealings with the Indians he showed himself an astute and unscrupulous politician, and a valiant soldier, who, by a species of military intuition became at once an adept in all the peculiarities of Indian warfare. His services were not sufficiently appreciated, and he returned to England broken in health and poor in purse. He was sent out on various voyages of discovery, and gave to New England the name she now bears. He died in London, and was buried in the choir of St. Sepulchre's church.

SMITH, JOHN, "of Cambridge," 1618–52; graduated at Cambridge, 1640; fellow of Queen's college, 1644, and for several years tutor and mathematical lecturer there; became a clergyman and was accounted "a man of great abilities, vast learning, possessing almost every grace and virtue which can adorn human nature." His *Select Discourses* were often reprinted and highly esteemed. Several biographies of him have been written by distinguished men.

SMITH, JOHN BLAIR, D.D., 1756-99, b. Penn.; graduated at Princeton, 1773; studied theology with his brother, and succeeded him as president of Hampden Sidney college, 1799; was an effective preacher in Virginia; pastor of the Third Presbyterian church, Philadelphia, 1791-95; president of Union college 1795-99; returned to his pastoral charge at Philadelphia, 1799, and died there of an epidemic disease.

SMITH, JOHN COTTON, LL.D., 1765-1845; b. Sharon, Conn., son of Cotton Mather Smith, descended from John Cotton and Richard Mather; graduated at Yale college, 1783. He practiced law in Litchfield co., 1786; member of the lower house, 1793 and 1796-1800; clerk of the house, 1799; speaker, 1800; member of congress, 1800-6. He was representative from Sharon in the state legislature, 1806-9, and member of the council. He was appointed judge of the supreme court, 1810; lieutenant governor in the same year, and governor, 1813-18. He was a contributor to the periodicals, and a member of several historical and antiquarian societies, A. B. C. F. M., etc.

SMITH, JOHN COTTON, D.D., b. Mass., 1826; graduated at Bowdoin college in 1847; studied theology at Gambier, Ohio; ordained to the Protestant Episcopal ministry in 1849; rector of St. John's church, Bangor, Maine; assistant minister of Trinity church, Boston in 1852; rector of Ascension church, New York, in 1860. He published essays, afterward collected in a volume entitled *Miscellanies, Old and New*, and he published several sermons and lectures. His writings show breadth of Christian spirit, and such certainty of faith as to preclude fear of new phases of truth. He d. 1882.

SMITH, JOHN E., b. Berne, Switzerland, 1816. In the late civil war he was aid-camp to Governor Yates of Illinois; in active duty at fort Henry, fort Donelson, Shiloh, and Corinth; made brig-gen., 1862; engaged in all the important battles of the Louisiana campaign. He was in the Mississippi and Atlanta campaigns in 1864, and marched with Sherman to the sea; col. 14th U. S. infantry, 1870; brevetted maj.-gen. regular army; retired, 1881.

SMITH, JOHN LAWRENCE, b. S. C., 1848; graduated at the University of Virginia, and the medical school of the university of South Carolina; civil engineer on the Charleston and Cincinnati railroad. He studied 3 years in France and Germany, practiced medicine in Charleston, S. C., 1844, and gave lectures on toxicology and agricultural chemistry. In 1846-51 he was mining engineer to the Turkish government, explored Asia Minor, discovered deposits of emery and corundum in the United States; invented the inverted microscope, 1851. He was professor of chemistry in the university of Virginia, and in the university at Louisville, Ky.; U. S. commissioner to the Paris exposition, 1867, and Vienna, 1872. He received the cross of the legion of honor from Napoleon III. He is a member of many scientific societies, president of the American association for the advancement of science, 1872; author of *The Progress and Condition of Several Departments of Industrial Chemistry*, 1867. He d. 1883.

SMITH, JOHN PYE, D.D., LL.D., 1774-1851, b. England; entered an Independent academy at Rotherham, in his 22d year; became classical tutor in the Homerton theological school (Congregational) 1800, divinity tutor 1813-43; and again classical tutor, 1843-50. He was a fellow of the Royal and geological societies. His principal works are: *Scripture Testimony to the Messiah*; *The Sacrifice and Priesthood of Christ*; *The Personality and Divinity of the Holy Spirit*; *Mosaic Account of the Creation and Deluge Illustrated by the Discoveries of Modern Science*, and *Scripture and Geology*.

SMITH, JONATHAN BAYARD, 1742-1812, b. Philadelphia, graduated at the college of New Jersey. He was a merchant in Philadelphia, a member of the continental congress, 1777-78, and for many years a judge of the court of common pleas.

SMITH, JOSEPH, 1790-1877; b. Roxbury, Mass.; d. Washington. He was appointed midshipman, 1809, commissioned lieut. 1813. He distinguished himself at the battle of Lake Champlain, 1814, and at the capture of some piratical vessels of Algiers, 1815. He was made commander, 1827, and capt., 1847, serving with the Mediterranean squadron. For some years he had charge of the Boston navy yard, and was chief of the bureau of yards and docks, 1847-69. He became rear-adm., 1862.

SMITH, JOSEPH. See MORMONS.

SMITH, JUNIUS, LL.D., 1780-1853, b. Conn.; graduated at Yale, and at the Litchfield law school. In 1832 he began to urge a scheme for the navigation of the Atlantic with steamships. He organized the British and American steam navigation company in 1836, under whose direction, two years later, the little steamer *Sirius* crossed the Atlantic.

SMITH, MATTHEW HALE, 1816-79, b. Maine; was a Universalist preacher and afterward joined successively the Presbyterians, Episcopalians, and Baptists; published reasons for some of these changes; became a lawyer, editor, politician, and business man; returned to theology; also was New York correspondent (Burleigh) of the Boston *Journal*. The latter part of his life was spent in New York and Brooklyn.

SMITH, MELANCTON, b. N. Y., 1810; entered the navy in 1826, and through successive grades became rear-admiral (retired) in 1870. He served through the Seminole war, fought the confederate steamer *Florida* in 1861, ran the confederate ram *Manassas* ashore at the capture of New Orleans, took part in the attacks on Port Hudson

fought the ram *Albemarle* in 1864, and commanded the frigate *Wabash* in the attacks on fort Fisher.

SMITH, MILES, D.D., 1550-1624, b. England; graduated at Oxford; studied deeply patristic literature and the oriental languages; became bishop of Gloucester, 1612; was a principal translator of King James's version of the Bible, for which he wrote the preface. A volume of his sermons was printed after his death.

SMITH, MORGAN L., 1822-74, b. N. Y.; enlisted in the regular U. S. army when young, and for gallantry in the Mexican war was made sergeant. He then engaged in business, and in 1861 raised and commanded a regiment from Illinois and Missouri. He was at fort Donelson and in the Shiloh, Vicksburg, and Chattanooga campaigns. He was promoted to the rank of maj.-gen. and commanded a division in Sherman's march to the sea. After the war he was consul at Honolulu.

SMITH, NATHAN, 1762-1828, b. Mass.; studied medicine, and in 1798 became professor in the medical school just established at Dartmouth college. He also delivered lectures at Bowdoin college, and at the university of Vermont. He wrote *Practical Essays on Typhus Fever* (1824); and *Medical and Surgical Memoirs* (1831).

SMITH, PERSIFER FRAZER, 1798-1858: b. Philadelphia; graduated at Princeton college 1815; studied law and practiced at New Orleans. He served in the Florida war, commanded the Louisiana brigade in the Mexican war under Taylor, and was brevetted brig.-gen. and maj.-gen. for gallantry at Monterey, Contreras, and Churubusco. He was a commissioner to conclude peace with Mexico, governor of Mexico, 1847, of Vera Cruz, 1848, also military commander of California and Texas.

SMITH, RICHARD, b. Ireland, 1823; when eighteen years of age came to the United States and settled in Cincinnati, where he worked in a carpenter shop for three years, when he became a reporter. In 1849 he received the appointment of superintendent of the Cincinnati chamber of commerce, and bought the *Price Current*, which he edited. In 1854 he bought into the *Gazette*, now the *Commercial-Gazette*, and after a few years became its managing editor, and still occupies the position.

SMITH, RICHARD SOMERS, b. Philadelphia 1813; graduated at West Point, where he was assistant professor of drawing, 1840-56, when he resigned from the army and became professor of mathematics and drawing in the Brooklyn polytechnic institute, where he remained till 1859. He served in the war against secession till 1863, when he resigned to become president of Girard college, where he remained till 1868. He was, 1868-70, professor of engineering at the Pennsylvania state polytechnic college, and of drawing at the U. S. naval academy, 1870-77; author of manuals on drawing and perspective. D. 1877.

SMITH, ROBERT, D.D., 1732-1801; b. England; graduated at Cambridge, and obtained a fellowship there; became rector of St. Philip's church, Charleston, S. C., 1759; was a volunteer soldier during the revolution; preached in Queen Anne co., Md.; president of Charleston college, 1786-98; first bishop of the diocese of South Carolina, 1795.

SMITH, ROBERT ANGUS, PH.D., b. Glasgow, Scotland, 1817; studied at the university of Glasgow and with Liebig at Giessen. He became a professional chemist; has given much study to disinfectants, ventilation, and climatology, and has published many papers on these and kindred subjects. In 1857 he was made a fellow of the Royal society, has been president of the Manchester literary and scientific society, and is a member of other scientific associations.

SMITH, ROBERT PAYNE, D.D., b. England, 1818; graduated at Pembroke college, Oxford, 1841, obtaining there three oriental scholarships; curate of Trinity, master of the Edinburgh academy, and afterward head-master of Kensington school; sub-librarian of the Bodleian library, having charge of oriental manuscripts, 1857-65; canon of Christ-Church, Oxford, and regius professor of divinity, 1865-71; and dean of Canterbury 1871 to the present time. He was a delegate to the evangelical alliance at New York, 1873, and was a member of the Old Testament revision committee. His published writings include several works of oriental scholarship; a defense of the authenticity and Messianic interpretation of Isaiah, Bampton lectures for 1865; and commentary on Jeremiah. D. 1895.

SMITH, SAMUEL, 1752-1839, b. Carlisle, Penn.; son of John Smith, a resident of Baltimore, 1759, who was member of the legislature and chairman of the committee of ways and means in the revolutionary war. Samuel was educated at Carlisle, Baltimore, and Elkton; entered his father's counting-room; and visited Europe, 1771; capt. in Smallwood's regiment, 1776; performed effective service on Long Island. He distinguished himself at Harlem and White Plains; lieut.-col. of the 4th Md. regiment, 1777; defended Fort Mifflin, and received a sword and the thanks of congress. He was at Valley Forge and at Monmouth. He was a member of the state legislature, and member of congress, 1793-1833; for a short time secretary of the navy under President Jefferson. In the war of 1812 he was maj.-gen. of the state militia, and active in the defense of Baltimore; mayor of Baltimore, 1835.

SMITH, SAMUEL FRANCIS, D.D., b. Boston 1808, graduated at Harvard College in 1829; studied theology at Andover, pastor of a Baptist church at Waterville, Me., and professor of modern languages in Waterville College, 1834-42; pastor at Newton, Mass.,

1842-54. He has published *Life of Rev. Joseph Grafton*. He edited the *Baptist Missionary Magazine* and *Christian Review*. He is the author of "My Country, 'tis of Thee," and other favorite hymns.

SMITH, SAMUEL STANHOPE, D.D., LL.D., 1750-1819; b. Penn.; was a pupil and teacher in his father's classical academy, where he also studied theology; tutor in the college of New Jersey, 1770-73; ordained and preached in Virginia, 1774; was the first president of Hampden-Sidney college, 1775-79; appointed professor of moral philosophy in the college of New Jersey, 1779, and of theology, 1783; vice-president, 1786, and president, 1795-1812. He was an eloquent preacher and of distinguished personal appearance and manners. Among his published writings are, *Lectures on the Evidences of Christianity and on Moral Philosophy*; *System of Natural and Revealed Religion*, and many separate sermons and lectures.

SMITH, SEBA, 1792-1868; b. Me.; educated at Bowdoin college. After editing at Portland the *Eastern Argus*, and the *Courier*, he removed to New York in 1842. His *Life and Letters of Major Jack Downing* (1833), a series of humorous letters on political subjects, was exceedingly popular. Among his works was *Way Down East* (1854).

SMITH, Rev. SYDNEY, a celebrated wit and humorist, and the original projector of the *Edinburgh Review*, was born at Woodford, in Essex, in 1771. His father was an eccentric English gentleman of moderate independence; his mother was the granddaughter of a French refugee; and Sydney, it was said, fairly represented both nations. He was educated at Winchester school, and New college, Oxford, and, having entered the church, became curate of Amesbury in Wiltshire. "The squire of the parish," he says, "took a fancy to me, and requested me to go with his son to reside at the university of Weimar; before we got there, Germany became the seat of war, and in stress of politics we put into Edinburgh, where I remained five years." During this time he officiated in the Episcopal chapel there, and published *Six Sermons* (1800). In conjunction with a few accomplished literary associates—Jeffrey, Horner, Brougham, Dr. Thomas Brown, Playfair, etc.—Smith started the *Edinburgh Review*, the first number of which appeared in Oct., 1802, constituting a new era in the history of periodical literature, and of independent thought and criticism in Gt. Britain. In 1803 Smith removed to London, and was soon popular as a preacher, as a lecturer on moral philosophy (1804-6), and as a brilliant conversationalist, the delight and wonder of society. Church preferment, however, came slowly. In 1806, during the short reign of the whigs, he obtained from lord Erskine, chancellor, the rectory of Foston-le-Clay, in Yorkshire; some eighteen years afterward the duke of Devonshire gave him the living of Londesborough, worth £700 per annum, to hold until Mr. Howard, son of the earl of Carlisle, came of age. In 1828 lord chancellor Lyndhurst presented him to a prebendal stall in Bristol, and enabled him to exchange Foston for Combe Florey, a more desirable rectory in Somersetshire. In 1831 earl Grey appointed him one of the canons residentiary of St. Paul's; and this completed his round of ecclesiastical preferments. He sighed for a miter, but it never came; and lord Melbourne is said to have regretted this omission in his career as prime minister. The writings of Smith subsequent to 1800 were his contributions to the *Edinburgh Review*, which he collected and republished, with other miscellaneous works, in 1839; *Peter Plymley's Letters*, written in 1807, to promote the cause of Catholic emancipation, and abounding in wit and irony worthy of Swift; *Sermons* in two volumes (1809); *Speeches on the Catholic Claims and Reform Bill* (1825-31); *Three Letters to Archdeacon Singleton on the Ecclesiastical Commission* (1837-39); *The Ballot*, a political pamphlet (1837); *Letter to Lord John Russell on the Church Bills* (1838); *Letters on Railways* (1842); *Letters on American Debts* (1843); etc. Though gay, exuberant, and witty to the last, Smith suffered from periodical attacks of gout and other complaints, and he died on Feb. 22, 1845. Ten years afterward, his daughter, wife of sir Henry Holland, physician, published a memoir of her father, with a selection from his letters.

The works of Smith were mostly written on temporary topics and controversies, yet they bid fair to take a permanent place in our literature as specimens of clear and vigorous reasoning, rich unctuous humor, and solid good sense. His jokes, exaggeration, and ridicule are all logical, driving home his argument; and his wit was sportive, untinctured with malice. His views on political and social questions were moderate, wise, and practical; and he lived to see most of them realized.

SMITH, WILLIAM, D.D., 1727-1803; b. Scotland; graduated at the university of Aberdeen in 1747; came to America in 1750; had charge of a college in Philadelphia, 1751-52; returning to England was ordained in the church of England in 1753; was inaugurated in 1754 provost of the university of Pennsylvania. His works were edited by bishop White in 8 vols.

SMITH, WILLIAM, 1769-1839; b. England; began life as a land-surveyor, became interested in the study of geology, made a careful examination into the geological strata of many parts of England, and collected a valuable museum of fossil remains, and prepared notes which have been published comparing the identity of formations where similar fossils were found. He made important geological discoveries for which he received the Wollaston medal from the geological society, 1831. He was a popular

lecturer, and in 1828-34, took charge of the model farm of Sir John V. B. Johnstone in Yorkshire. In 1838 he was commissioned to select the stone for the new parliament buildings, and subsequently received a government pension of £100. He pub. a treatise on *Irrigation*, 1806, *Mineral Survey or Delineations of the Strata of England and Wales*, 1815, and other works; and also issued, 1819-24, 21 colored geological maps of English counties.

SMITH, SIR WILLIAM, LL.D., b. London, 1813; graduated at the university of London, having won the first prizes in Latin and Greek; professor of Greek, Latin, and German, in Highbury and Homerton colleges (independent) and of the Greek and Latin languages and literature in New college, consolidated from the former two; classical examiner in university of London, 1853; and editor of *Quarterly Review*, 1867. He has published many approved classical school-books, an English-Latin dictionary, a Biblical and classical atlas, and a series of student's histories in which he was assisted by his brother Philip. His dictionaries of classical antiquities, biography, and mythology, of the Bible, and of Christian antiquities, have great value, and have attained a large circulation in England and the United States. He was knighted in 1892, and died 1893.

SMITH, WILLIAM FARRAR, b. St. Albans, Vt., 1824; otherwise known as "Baldy"; graduate of West Point, 1845; rose through successive grades to maj., 1863; assistant prof. of mathematics at West Point 1846-48 and 1855-56. He was assigned to the survey of the Lake Superior region, Texas, and California, and was placed on the commission to decide the Mexican boundary line. At the beginning of the civil war he was sec. of the light-house board, at Washington. He took command of the 3d Vt. vols., 1861, and was engaged in the first battle of Bull Run, on the Chickahominy, at South Mountain, Antietam, and Fredericksburg, in the latter commanding the 6th army corps. He was chief engineer of the department of the Cumberland, of the Mississippi, at Chattanooga, and Missionary Ridge. He commanded the 18th corps, army of the Potomac, 1864, and was present at Cold Harbor, and Petersburg; pres. International telegraph company 1864; brevetted col. for White Oak Swamp and Antietam; and maj. gen. for Chattanooga and gallant service throughout the war. Resigned, 1867, and for a time was on the police board of New York city. Retired from the Army 1889.

SMITH, WILLIAM HENRY, b. London, 1825; son of a well-known bookseller, publisher, and news-agent. He was educated at the grammar school, Tavestock, and in due course became partner in his father's firm. In 1863 he was returned to parliament from Westminster as a Conservative, defeating John Stuart Mill, and retained his seat continuously until his death. He was financial sec. of the treasury, 1874-77, first lord of the admiralty, 1877-80, and in 1885 was appointed sec. for war. In Gilbert's *H. M. S. Pinafore* he is burlesqued under the title of Sir Joseph Porter, K.C.B. In 1887 he was appointed first lord of the treasury, and subsequently acted as the Conservative leader of the House of Commons. In 1891 he was made Lord Warden of the Cinque Ports, and died in the same year, Oct. 6th.

SMITH, WILLIAM ROBERTSON, b. Scotland about 1846; graduated at the university of Aberdeen, and continued his studies at Bonn, Göttingen, and Berlin; was appointed assistant professor in the University of Edinburgh; and afterward Professor of Oriental Languages and Old Testament exegesis in the Free Church College at Aberdeen. When his article on "The Bible," in the new edition of the *Encyclopædia Britannica* appeared, it excited suspicions of heresy, which in 1876 led to charges against him in the Presbytery of Aberdeen, which referred the case to the General Assembly. The Assembly directed the Presbytery to go on with the trial, and the Presbytery referred the matter again to the Assembly. Professor Smith having at length been suspended from his professorship and restored by the Assembly, was, on the appearance of an additional article in the *Encyclopædia*, suspended again by the commission of the General Assembly, and the case again came before the Assembly of 1881. He was removed from the professorship of Hebrew in the Free Church Coll., Aberdeen, by an extraordinary act of the General Assembly; and after that was associated with Prof. Baynes in editing the *Encyclopædia Britannica*. In 1883 he was appointed Prof. of Arabic in the Univ. of Cambridge. He has published *The Old Testament in the Jewish Church*, 1880; *The Prophets of Israel*, and *their Place in History to the Close of the Eighth Century B.C.*, 1882; etc. Died 1894.

SMITH, WILLIAM STEPHENS, 1755-1816; b. N. Y.; educated at the college of New Jersey. He was aid-de-camp of Sullivan, Steuben, and Washington, successively; secretary of legation in London in 1785, to John Adams, whose daughter he married; surveyor of New York: a member of the assembly of that state, and of congress.

SMITH COLLEGE, at Northampton, Mass., for the education of women exclusively, was founded in 1875 by the munificence of Miss Sophia Smith of Hatfield, Mass. Its endowment amounts to \$600,000, and it has admirable buildings, valued at \$650,000. It has an ample and beautiful site in one of the most charming villages in the valley of the Connecticut. Its high standard of admission and its curriculum place it among colleges of the first rank. It had (1897) 60 professors and teachers, and 932 students. L. Clark Seelye, D.D., LL.D., president.

SMITHFIELD. This name has become so celebrated, in connection with a cattle-market in London that it has been applied to similar establishments elsewhere. Smithfield, in the 12th c., was an open spot which served the citizens as a playground and a place for a stroll. Being a little n. of Newgate, and w. of Aldersgate, it was outside the city walls. It was in Smithfield that the rebel Wat Tyler met his death in 1381. Several noted tournaments were held here; and the place is associated with trials by battle,

the burnings of martyrs, public executions during many centuries, and a variety of incidents connected with the history of the metropolis.

The most celebrated fair in England, Bartholomew fair (q.v.), was always held in Smithfield.

A cattle-market was held in Smithfield at least seven centuries ago, for Fitzstephen has mentioned it in 1150. The corporation had official control over the market for more than 500 years, dating from 1345; and the city authorities have never to this day relaxed their hold over the one only live-cattle market in the metropolis. At one time there was a project for removing the market to a field near Sadlers' Wells, at another to a spot near the n. end of Gray's Inn lane; while a spirited projector spent £100,000 in building a new market at Islington; but powerful influences prevented the removal of the cattle-market until 1855. The last market-day in the old spot was on June 11 in that year; after which the trade was transferred to the large and very complete establishment built by the corporation at Pentonville. For several years after this Smithfield was practically useless. In 1860, however, the corporation obtained an act for erecting market buildings on the site of Smithfield, and the first stone of a magnificent dead-meat market, from the designs of Mr. Horace Jones, the city architect, was laid in June, 1867. The building, which was formally opened in Nov., 1868, is 636 ft. long by 246 broad, is traversed by numerous avenues, and has about 200 shops for dealers in meat, which is partly country-killed. This arrangement has enabled the city authorities to abolish Newgate market, which had become a serious obstruction to city traffic. Under the market three railways, sunk deeply below the ground-level, traverse the area, one going eastward to Aldersgate and Finsbury, one southward to Ludgate and Blackfriars, and one north-westward to King's Cross and the n. of London. Near the middle of Smithfield is a circular spiral road descending to an underground railway goods-station. The remainder is laid out in well-paved carriage and foot ways, with a small ornamental green or garden, including paths, seats, and a drinking-fountain. There is also a new market for poultry, butter, cheese, pork, etc., distinct from the meat-market. The extensive new works and alterations have greatly improved the appearance of Smithfield, and increased its salubrity.

SMITHSONIAN INSTITUTION, at Washington, district of Columbia, was organized by act of congress in 1846, in accordance with the will of James Smithson, who bequeathed the reversion of an estate amounting to \$515,169 to the United States, to be devoted to "the increase and diffusion of knowledge among men." He was an Englishman, a natural son of Hugh, third duke of Northumberland, and Mrs. Elizabeth Macie, a niece of Charles, duke of Somerset. He devoted his life to scientific pursuits, especially to chemistry, and died at Genoa in 1829.

The amount at first received from his bequest, \$515,000, was subsequently increased by the residuary estate to \$541,000, which was deposited in the treasury as a perpetual loan, the interest to be employed forever in promoting the object of the testator. By the plan adopted, the accumulations of interest were first employed in erecting a commodious and secure building of imposing architecture as the home of the institution. The board of regents is composed of the vice-president of the United States, the chief-justice of the supreme court; three senators, appointed by the vice-president; three representatives, appointed by the speaker of the house; and six citizens, appointed by joint resolution of congress, two of whom must be residents of the District of Columbia, and no two can be of any one state. The regents choose one of their number as chancellor, and appoint a secretary, who is director of the institution, chooses his own assistants and conducts the active operations. Besides the regents, the president and vice-president of the United States and the cabinet officers constitute the "establishment" styled the "Smithsonian Institution." When the trust was accepted, widely different ideas were entertained in congress and by distinguished men throughout the country concerning the methods by which the object of the testator could be best attained. One proposed a university of the highest possible grade; another an observatory to surpass all others on the globe; another the cultivation of seeds and plants for distribution, with printing-presses, and courses of lectures on physical and moral science, government, and public law; a third, an institution for experiment and research in physical science, especially pertaining to useful arts and the development of the natural resources of the country; and a fourth, an establishment for rearing sheep, horses, and silkworms, with a great library attached. The first secretary, the eminent Joseph Henry, at the time of his appointment professor in Princeton college, in entering on his office, drew up for the regents a scheme for the operation of the institution which they cordially adopted and have since maintained. Its leading principles are that, as the testator's design was to increase and diffuse knowledge *among mankind*, the institution should spend its labor and resources on no object merely local, or even national; and should not devote its energies to anything which could be done as well by any existing organization. In accordance with these principles, in the progress of the institution, its library has been incorporated with the library of congress; its meteorological observations to the U. S. signal service, of which they were taken as the foundation; and the national museum, deposited by law in the Smithsonian building, from the beginning was partly, and is now entirely, supported by the government. Having originated and developed these branches of scientific pursuit, the institution devotes its energies and means: I. To the INCREASE

of human knowledge. To promote this object it issues three series of publications: 1. *Contributions to knowledge*. These are memoirs pertaining to every branch of physical science, and contain positive additions to knowledge, based on original research, but excluding everything resting on an unverified hypothesis. 2. *Miscellaneous collections*, consisting of monographs designed to facilitate the study of natural history, chemistry, bibliography, etc. Papers presented for publication in either the first or second series are submitted to competent committees for examination, first, as to their being real additions to the existing knowledge of the subjects to which they pertain; second, whether as such they are worthy of publication by the institution. No restriction is made in favor of any particular branch of knowledge. The design is to stimulate men who have talents for original investigation to make researches, by offering to publish to the world an account of their discoveries, and to aid them in defraying the necessary expenses. Beyond this, apart from presenting to the author a few copies of his contribution, no remuneration is made; the publication under such favorable auspices, combined with the association of the author's name with Smithson's, being considered and accepted as a sufficient honorarium. 3. *Annual reports*, containing a statement to congress of the operations of the institution; with an appendix of translations from foreign books, biographies of distinguished scientists, ethnological and meteorological essays, correspondence, and accounts of unusual phenomena. II. The diffusion of knowledge is specially promoted by a system, early commenced and sedulously prosecuted, for the interchange of American and foreign scientific thought and achievement. This system has now attained great proportions. It brings nations, societies, and individuals into close communion. Through it the publications of the national government, as well as those of the institution, are exchanged. It is now familiarly known as the Smithsonian system of international exchanges, and is the medium for the exchange of scientific and literary materials between the United States and other nations. By means of it thousands of works, embracing the details of the latest inventions and discoveries, are brought to America; while, in turn, a knowledge is diffused abroad of whatever is done in the United States to advance, by the increase of knowledge, the welfare of men. There are now about 10,000 foreign societies in correspondence with the institution, besides many individuals, all freely sharing the benefits of the arrangement. The packages of exchanges are transmitted by the principal transportation companies of Christendom either without charge or at reduced rates, and are passed through all custom-houses free of duty.

In 1879 an appropriation was made by congress of \$250,000 for the erection, on the Smithsonian grounds, of a building for the national museum, which is under the charge of the institution, but has outgrown the accommodations possible in its one edifice. The Smithsonian fund, at interest in the U. S. treasury, amounted (1897) to \$912,000. The distinguished services of Prof. Henry, as the first secretary and director, extended from 1846 to his death in 1878; Prof. Spencer F. Baird, who from 1850 had been his chosen assistant, was secretary until his death, 1887, when Prof. S. P. Langley became secretary.

SMITH RIVER, a magisterial dist., Patrick co., Va. Pop. '90, 4563.

SMOKELESS POWDER. In the past thirty years the progress which has been made in the regulation of the explosive force of gunpowder, so as to adapt it to the safe development of very high energy in guns presenting great differences in regard to size, and the work which they have to perform, has been most important. The different forms of gunpowder which were applied to war purposes in this and other countries until within the last few years, presented comparatively few differences in composition and methods of manufacture from each other and from the gunpowder of our ancestors. The increased powder charges, and the necessity of a slower burning powder, necessitated important changes, and the very general adoption of machine guns and rapid-fire artillery, made it desirable to provide a powder for them that would produce comparatively little or no smoke, as their efficient employment becomes greatly limited when, after a very few rounds rapidly fired with black powder, the objects against which it is desired to direct the fire are more or less completely hidden by the interposed smoke. Hence, much attention has of late been directed to the production of smokeless, or nearly smokeless, powders for naval and military use. The properties of ammonium-nitrate, of which the products of decomposition by heat are, in addition to water vapor, entirely gaseous, have rendered it a tempting material to those who have striven to produce a smokeless powder; but its deliquescent character has been a formidable obstacle to its application as a component of a useful explosive agent. By incorporating charcoal and saltpetre in particular proportions with ammonium-nitrate, F. Gaus claims to have produced an explosive material free from the hygroscopic character common to other ammonium-nitrate mixtures, and furnishing only permanently gaseous and volatile, or smokeless, products of explosion.

The anticipations were not realized, but they led the talented German powder-maker, Mr. Heideman, to produce an ammonium-nitrate powder possessing remarkable ballistic properties, and producing comparatively little smoke, which speedily disperses. It yields a very much larger volume of gas and water-vapor than either black or brown powder, and is considerably slower in action than the latter; the charge

required to produce equal ballistic results is less, while the chamber-pressure developed is lower, and the pressures along the chase of the gun are higher than with brown powder. No great tendency is exhibited by it to absorb moisture from an ordinarily dry, or even somewhat moist, atmosphere, but it rapidly absorbs water when the hygroscopic condition of the air approaches saturation, and this greatly restricts its use. About five years ago reports began to reach us from France of the attainment of remarkable results with a smokeless powder employed with small arms, and to which the name *Mélinite* (which see) was given. Changes of greater or less degree have taken place since the first reports, and the material at present in use as *Mélinite* belongs to the nitro-cellulose or nitro-gun-cotton preparations. A comparison between the chemical changes attending the burning or explosion of gunpowder, and of the class of nitro-compounds represented by gun-cotton, at once explains the cause of the production of smoke by the former, and of the smokelessness of the latter. Whilst the products of explosion of the nitro-compounds consist exclusively of gases and of water-vapor, gunpowder, being composed of a large proportion of saltpetre, or other metallic nitrate, mixed with charred vegetable matter, and variable quantities of sulphur, furnishes products of which over 50 per cent. are not gaseous, even at high temperatures, and which are in part deposited as a fused solid—which constitutes the fouling in a fire-arm—and in part distributed in an extremely fine state of division through the gases and vapors developed by the explosion, thus giving to these the appearance of smoke as they escape into the air. So far as smokelessness is concerned, no material can surpass *gun-cotton* (or other varieties of nitro-cellulose); but even if the rate of combustion of the fibrous explosive in a fire-arm could be controlled with certainty and uniformity, its application as a safe propulsive agent is attended by so many difficulties that the non-success of the numerous early attempts to apply it to that purpose are not surprising. Those attempts commencing soon after the discovery of gun-cotton in 1846, and continued many years later in Austria, consisted entirely in varying the density and mechanical condition of employment of the gun-cotton fibre. No difficulty was experienced in thus exercising complete control over the rapidity of burning in the open air; but when the material was strongly confined, as in the chamber of a gun, such methods of regulating its explosive force were quite unreliable, as some slight unforeseen variation in its compactness or in the amount and disposition of the air-spaces in the mass, would develop very violent action. Much more promising results were subsequently obtained by Sir Frederick Abel by reducing the fibre to a pulp as in the ordinary process of making paper, and converting this into highly compressed homogeneous masses of the desired form and size. This method, improved upon and somewhat modified, is employed at the gun-cotton factory at the United States Torpedo Station. Although comparatively small charges of gun-cotton have often given high velocities without injuring the gun from which they were fired, the uniform fulfillment of the conditions essential to safety have proved to be beyond absolute control, even in guns of small calibre; consequently, before military authorities became fully alive to the advantages that accrue from the employment of an entirely smokeless explosive in artillery, experiments were discontinued for a time.

In sporting pieces considerable success attended the production of gun-cotton cartridges, the rapidity of its explosion being controlled by various methods. In some cases a lightly-compressed pulped gun-cotton charge of pellet-form was used, the uniform action of which was secured by simple means. Colonel Shultze, of the Prussian Artillery, produced a nearly smokeless sporting powder from finely divided wood, converted after purification into a mildly explosive form of nitro-cellulose, and impregnated with a small portion of an oxidizing agent. Subsequently this powder was produced in a granular form, and rendered considerably more uniform in character, and less hygroscopic, bearing a close resemblance to sporting powder made of nitro-cotton reduced to a pulp, incorporated with the nitrates of potassium and barium, and converted into grains through the agency of a solvent and a binding material. Both these powders produce very little smoke compared with black powder, but do not compete with the latter in regard to accuracy of shooting when used in military arms. In past years both camphor and liquid solvents have been applied to the hardening of the surfaces of granulated or compressed masses of gun-cotton and of this class of its preparations with a view to render them non-porous. In some foreign smokeless powders acetic ether and acetone have been also used, not merely to harden the granules or tablets of the explosive, but also to convert the nitro-cellulose, in the first instance, into a more or less gelatinous condition, so that it can readily be incorporated with other components, and rolled or spread into sheets, or pressed into molds, or squirted into wires, rods, or tubes while still in a plastic state. When the solvent has afterwards been removed, the hardened, horn-like, or somewhat plastic product is cut up into tablets, or into strips or pieces of suitable dimensions for conversion into charges or cartridges. Another class of smokeless powder, similar in physical characteristics to these nitro-cellulose powders, but containing nitro-glycerine as an important component, was originated by Mr. Alfred Nobel, the inventor of dynamite, and bears resemblance in its physical characteristics to blasting-gelatin, one of the most interesting of known violent explosive agents. When one of the lower products of nitration of cellulose is impregnated with the liquid explosive, nitro-glycerine, it gradually loses its fibrous nature, becoming gelatinized

while assimilating the liquid ; and the resulting product almost possesses the characters of a compound. This preparation, and certain modifications of it, have acquired high importance as blasting-agents more powerful than dynamite, and are possessed of the valuable property that their prolonged immersion in water does not separate from them any appreciable proportion of nitro-glycerine. The nitro-glycerine powder first produced by Nobel was almost perfectly smokeless, and developed very high energy, accompanied by moderate pressures at the seat of the charge, but it possessed certain practical defects which led to the development of several modifications of that explosive, and various improvements in manufacture. The relative merits of this class of smokeless powder and of various kinds of nitro-cellulose powder, are now under careful investigation, and several more or less formidable difficulties have been met with in their application, in small arms especially ; these arise in part from the comparatively great heat they develop, which increases the erosive effects of the products of explosion, and in part from the more or less complete absence of solid products. The surfaces of the barrel and of the projectile being left clean after the firing, are in a condition favorable to their close adhesion while the bullet is propelled along the bore, with the consequent establishment of very greatly increased friction. The latter difficulty has been surmounted by more than one expedient, but always at the cost of absolute smokelessness. The importance of insuring that the powder shall not be liable to undergo chemical change detrimental to its efficiency or safety, when stored in different localities where it may be subject to considerable variations of temperature, necessitates qualities not very easily secured in an explosive agent consisting mainly of the comparatively sensitive nitro-compounds to which the chemist is limited in the production of a smokeless powder. The extensive use of smokeless, or nearly smokeless, powder in one or two special military displays is considered as indicating a change that will necessarily take place in the conditions under which engagements on land will be fought in the future, provided these new explosives thoroughly establish and maintain their position as safe and reliable propelling agents. The powder is not absolutely smokeless, but the transparent film of smoke produced by independent rifle-firing is not visible at a greater distance than 300 yards ; at shorter distances it resembles the puff of a cigar. The most rapid salvo-firing by a large number of men does not have the effect of obscuring them from distant observers. The practical difficulties attending the utilization of the high velocities made possible by the newer style of powder have been found so very formidable that comparatively narrow limits at present restrict the powers of taking advantage of the increased ballistics that they present. It has been found that the strength of the gun carriages and the character of the arrangements used for absorbing the force of the recoil of the gun, need considerable modifications, not easy of application in some instances. Greater strength and perfection of manufacture are deemed imperative in the case of the hollow projectiles or shells to be used with charges of a propelling agent by the firing of which in the gun they may be submitted to comparatively very severe concussions. The increased friction to which portions of the explosive contents of the shell are exposed by the more violent setting back of the mass, are found to increase the possibility of their accidental ignition before the shell has been projected from the gun. A difficulty is also presented by the increased velocity of the shell in the matter of the rate of burning of the time fuse. Austria, England, France, Germany, Italy, Japan, Switzerland, are all experimenting with smokeless powders. One of the principal objects sought is to render detonation impossible by chemical and mechanical means, and to make use of a slowing agent which would give high and constant velocities with low and regular pressures. There must also be a freedom from noxious or irrespirable gases.

BALLISTITE, as the Nobel powder is called, has been definitely adopted by the Italian government. During the past year the military authorities of that country have ordered a quantity sufficient for 160,000,000 small-arm cartridges ; and they are experimenting with it in high-power guns with satisfactory results.

POUDRE B. (*Vieille Powder*) is the invention of Vieille, a Frenchman, and is the smokeless powder at present used in the Lebel rifle. Its composition is a secret jealously guarded by the French authorities. It is claimed that it gives a high muzzle velocity with only a slight recoil, and with but little strain on the breech mechanism. A French powder, known as BN., and supposed to be a modification of Poudre B., has given a muzzle velocity of 2540 feet a second from a 29.45 inch, 36 calibre, high-power gun, and of 2749 feet a second from a 5.9 inch Canet rapid-fire gun. As put up in cartridges the BN. is cut up into strips of about one-quarter inch thickness, which are laid side by side, and packed in canvas bags for high-power guns, and in metallic cases for rapid-fire guns.

CHILWORTH SPECIAL, is the powder which has until lately been used in the Armstrong guns, the smoke being nearly transparent and soon dissipated. In firing with it to leeward the target is not obscured for more than an instant of time. The Chilworth Special cartridges are put up in hermetically sealed metallic cases containing a cylindrical space through the middle, in which is placed a bag containing one pound of rifle large grain powder. It leaves no residue in the bore to interfere with the essential requirements of rapid loading.

CORDITE takes its name from the form in which it is made up. It is supposed to be

composed of ordinary blasting gelatine with soluble nitro-cellulose added, and with a solvent sufficient to give it the consistency of a moderately thick jelly. This is pressed through holes to form cords, which at first are soft and pliable, but which become toughened after the evaporation of the solvent. Then these cords, which are either of a circular or square cross section, are cut the necessary lengths, and packed side by side in cartridge cases. The rate of burning depends on the thickness of the cord. It is of a chocolate-brown color on the outside, and when broken shows a light gray section much like fine-grained pumice-stone. When burned in the open air in small quantities, it burns noiselessly and with moderate quickness, and gives off a bright yellow flame. It leaves no residue when fired, and gives off a slight filmy vapor which disappears very quickly. It is claimed that higher velocities and lower pressures have been obtained with charges but half the weight of those of ordinary gunpowder. Sir William Armstrong has asserted that in the 6-inch rapid-fire gun, a velocity of 2300 feet a second has been obtained from this powder with a pressure somewhat over 12 tons. It has been exposed to a very high and to a very low temperature without being injuriously affected.

GELBITE is a smokeless powder invented by Dr. L. H. Emmens, the inventor of Emmensite (see EXPLOSIVES of HIGH POWER) and is obtained by treating specially prepared paper with emmensite. It is in the form of thick yellow paper, which, but for the pronounced yellow of its color, corresponds to what has already been said of Poudre B. In trials at the navy-yard, Washington, from revolvers and rifles, this powder gave off but a slight dusty puff, which was very quickly dissipated, and which was accompanied by a sharp, quick report.

GRÄKRUT (Gray Powder) is a Swedish powder, the invention of a Mr. Skoglund. It was tested during the year from a 25 millimetre gun in comparison with the Belgian Wetteren powder, with the following results: With a charge of the Grakrut equal to 70 per cent. of the other powder, the initial velocity was increased 33 per cent., and the chamber pressure 5 per cent. With the charge of Grakrut decreased to 62 per cent. the initial velocity was increased 24 per cent. without any appreciable increase of chamber pressure. In competitive tests from Nordenfeldt guns the smoke from ordinary powder was not dissipated for twenty-five seconds, while that from the Grakrut was in the form of a transparent vapor, remaining visible only five seconds. Hengst powder is prepared from straw—preferably old straw—made into a pulp and treated with a mixture of two parts by weight of sulphuric acid to one of nitric acid for from fifteen to twenty hours, after which the acid is strained off and the pulp washed in water until no trace of acid remains. The mass is then steeped in a solution of hyposulphite of soda or other suitable alkaline solution, and then slowly dried. When dry it is compressed and then formed into grains or any other desired shape. In competitive trials with ordinary black powder it has given increased velocities with smaller charges; it gave off but little smoke, and that only a light vapor which rapidly condensed and immediately afterwards disappeared; it left but little residue. Several rounds fired in rapid succession did no more than slightly warm the barrel, while an equal number fired with the ordinary black powder heated it considerably. In the dark it gave out a faint pale blue glow at each discharge. Colonel Shakespeare, of the British army, made the following interesting experiments with this powder: He soaked two ounces in water for forty-eight hours and then dried it; when fired it was found to have been uninjured. He then steamed two ounces for twenty minutes on a copper-wire gauze, and alongside of it treated an equal quantity of black powder in the same manner; without drying he fired them. The Hengst powder exploded, but rather slowly, while the black powder only fused. Other experiments have proved this powder to be free from danger of explosion from friction or concussion, and it is considered to possess weight for weight, about 150 per cent. greater strength than ordinary gunpowder.

SCHWAB'S SMOKELESS POWDER was invented by Major Schwab, of the Austrian army, is of a gray-black color, and has a very large grain, larger than is found with ordinary powders. It burns slowly in the open air, gives off a vapor like attenuated steam, and emits a slight odor very similar to that of ordinary powder. When made up into cartridges it ignites rapidly and gives much higher velocities, with lower pressures, than ordinary powder. In one experiment from a field piece this was the case, with a charge only 50 per cent. of that of ordinary powder. Continuous volley firing resulted in a transparent vapor that in no way impeded a constant view of the object which was being fired at. Samples of it have already been kept over four years without undergoing chemical change. For further information on explosives see GUN-POWDER, HIGH-EXPLOSIVES.

Some extensive and reliable experiments with smokeless powders were made in Germany, in August, 1890, the powder used being the composition of 1889, known as Cn-S9. The firing raised a feeble brown cloud, which was so thin that immediately after a discharge the next shot could be aimed, as the target continued distinctly visible. Even in heavy, rainy weather the brownish clouds dispersed in less than three seconds, whereas black powder, fired at the same time, collected in front of the gun a cloud of smoke which hung about a longer time and rendered a rapid fire impossible. The combustion left but little residue, and the heating of the gun and cartridge case was also sensibly less than with the black powder.

American wood powder is a mechanical mixture of cellulose, starch, sugar, bituminous coal, and charcoal thoroughly incorporated together and pulverized. It is formed into grains and treated with nitric and sulphuric acid, neutralized by repeated boilings in water and alkaline solutions. It is then dried, treated with a solution of saltpetre, again dried, when it is ready for use. It was the method of controlling the combustion that placed this powder among the safe explosives, and this was done by incorporating carbon with the nitro-cellulose. The greatest care is exercised in cleansing it from free acid by repeated washings. It deflagrates without explosion if not confined, but when confined in a gun-barrel it exerts a very powerful driving force.

Among the new explosives produced during 1895-96 are Cannonite, Fulgurite, Progressite, Americanite, and Schnebelite, the relative strength of which is given in the following table:—

NAME OF EXPLOSIVE.	Percentage of Strength.	NAME OF EXPLOSIVE.	Percentage of Strength.
Perunite B.....	100.0	Emmensite.....	66.0
Perunite C.....	91.0	French nitro-glycerine.....	63.0
Rosell's mixture.....	89.5	Dynamite No. 1.....	62.6
Perunite D.....	83.0	Cannonite.....	62.0
Americanite.....	82.0	Amide powder.....	59.0
Explosive gelatine.....	81.0	Progressite.....	58.5
Schnebelite.....	80.0	Tomite.....	57.0
Rack-a-rock.....	79.0	Bellite.....	56.0
Hellofite.....	78.0	Oxonite.....	54.4
Nitro-glycerine, best quality.....	73.0	Atlas powder, No. 1.....	54.0
Nobel's smokeless powder.....	70.0	Melinite.....	49.0
Explosive gelatine made from No. 5 nitro-glycerine.....	68.0	Silver fulminate.....	48.2
United States Navy gun-cotton.....	67.5	Mercury fulminate.....	47.5
Fulgurite.....	67.0	Rifle powder.....	35.0
		Mortar powder.....	30.0

SMOLENSK, a government of European Russia, bounded on the e. by the governments of Moscow and Kaluga. Area, 21,638 sq. miles. Pop. '93, 1,469,756.

SMOLENSK, a fortified t. of Russia, capital of the government of the same name, is picturesquely situated on a range of steep declivities overlooking the river Dnieper, 250 m. w.s.w. of Moscow. It is one of the oldest towns in the empire, having been a place of note in the 9th c., is surrounded by massive walls, and has cathedrals, churches, and several monasteries, a diocesan seminary, a gymnasium, a military school for nobles, hospitals, etc. Smolensk carries on manufactures of linens, soap, leather, and carpets, and a considerable export trade in corn and flax. Pop. '93, 41,429. Smolensk is historically notable as the scene of a bloody repulse of the Russians, under Barclay de Tolly and prince Bagration, by Napoleon, Aug. 17, 1812, when on his march for Moscow.

SMOLLETT, TOBIAS GEORGE, an eminent British novelist, b. in 1721, was descended from an old and distinguished family in Dumbartonshire. His grandfather, sir James Smollett of Bonhill, was one of the commissaries or consistorial judges of Edinburgh, and sat in the Scots parliament as representative of his native county. Had the novelist survived about four more years than the term of his too short life, he would, as heir of entail, have succeeded to the ancestral estate in the beautiful vale of Leven. He lost his father while very young; but he was well educated, and afterward apprenticed to a surgeon in Glasgow. He is said to have wished to enter the army, and being disappointed, to have avenged himself on his grandfather, who thwarted his inclinations, by describing sir James under the unamiable character of the old judge in *Roderick Random*. This is related by Scott and all the biographers, but it must be wrong; for sir James, the grandfather, died in 1731, when Tobias was only in his tenth year. The duty of attending to the education and settlement of the youth would naturally devolve on his widowed mother and on the laird of Bonhill, his cousin. It is certain, however, that Smollett inherited no fortune; and in his 18th year, he went to London with a tragedy which he had written on the assassination of James I. of Scotland, and which he trusted would lead to distinction, if not wealth. He was grievously disappointed, and was glad to accept the post of surgeon's-mate on board one of the ships in the unfortunate expedition to Carthagera, in 1741. He soon quitted the service in disgust, although not before he had seen enough of naval life and character to be of inestimable value to him as a novelist; and returning to London, he commenced, and for the remainder of his life followed, the profession of an author. He made, indeed, repeated attempts to obtain practice as a physician, and in 1750, got a diploma of M.D. from Aberdeen; but his hasty irritable temper and independent spirit, joined to his natural propensity to satire, were fatal to his hopes. Even his literary career was a ceaseless warfare. In 1748, in his 27th year, he produced his *Roderick Random*, which was read with the utmost avidity, and seemed at once to place its author very near, if not in the actual rank of Fielding as a novelist. In 1751 appeared *Peregrine Pickle*, a more ambitious and not less successful work, and in 1753, *Ferdinand Count Fathom*, an inferior production, though containing scenes of striking adventure and eloquent description. Smollett next translated *Don Quixote* (1755), in which, it is admitted, he was surpassed by Motteux and Jarvis. He then undertook the editorship of a new Tory journal, *The Critical Review*, which was the most unfortu-

nate of all his engagements, as it involved him in endless quarrels and personalities. For one article, an attack on admiral Knowles, he suffered three months' imprisonment, and was fined £100. In 1758 he published his *History of England*, 4 vols. quarto—a history from the descent of Julius Cæsar to the treaty of Aix-la-Chapelle in 1748, but which was begun and completed in 14 months, realizing for its author a sum of £2,000. Though superficial and inaccurate, this history has passages of fine animated writing and masterly delineation of character. We next find Smollett involved in political controversy with Wilkes and others, and defending lord Bute's administration; but he wanted tact and temper for work of this description, and reaped no laurels as a politician. Another novel appeared in 1760–61, *The Adventures of Sir Launcelot Greaves*; in 1766 two volumes of querulous *Travels in France and Italy*; in 1769 *The Adventures of an Atom*, a political satire unworthy of its author; and in 1771, only a few months before his death, *The Expedition of Humphry Clinker*, the best of all the novels of Smollett; and in the opinion of Thackeray, one of the very best in the whole range of imaginative literature. Worn out with literary cares, private misfortunes, anxiety, and ill-health, the novelist retired to Italy, and died at Leghorn, Oct. 21, 1771, in the 51st year of his age.

As a novelist, Smollett is distinguished by his broad humor and burlesque, the great variety of his incidents and characters, and the excellence of his easy, picturesque style of narrative. He is often careless, but rarely dull. He does not indulge in digressions, like Fielding, and though less of a literary artist than his great English rival, his works are read with more intense interest. He had, in fact, greater imagination and poetical sensibility. He added largely to our stock of original characters and humorists—*Strap*, *Tom Bowling*, *Morgan the Welshman*, *Lismahago*, and *Matthew Bramble* are still unsurpassed. Delicacy of taste was denied to both Fielding and Smollett, and perhaps the latter is the more gross and sensual of the two.

SMUGGLING is a violation of those laws regulating commerce which are enacted by the U. S. congress under the powers given them in that regard by the constitution, and is made a penal offense by the statutes of the general government. The main provisions of the present law (Rev. Stat., tit. xxxiv., chap. 10) are that the goods which are attempted to be introduced contrary to the tariff regulations or under false representations, shall be seized, and, on condemnation of the court, forfeited and sold, while the guilty party is liable to a fine of not more than \$5,000 and not less than \$50, and to imprisonment for not more than two years, or to both. Fines and penalties are also provided for officers of vessels conniving in smuggling or resisting the revenue officers. The procedure is in the U. S. district or circuit court, and is instituted by the district-attorney. After condemnation and sale, the proceeds minus costs and expenses are distributed, part going to the informer (if there were any such, distinct from the officers), part to the government, and part to the custom officers of the port or district. Very wide discretion and great powers are given, necessarily, to the officers employed in carrying out these laws. Their right of search extends four leagues from the coast. They may examine boxes, trunks, papers, letters, stores, warehouses, and all places where smuggled goods might be concealed. The person of a passenger is not exempt from search. Upon obtaining an order from the proper court, an officer may compel importing merchants, or others, to exhibit their books or bills of lading.

SMUT, the popular name of certain small fungi of the section *coniomycetes*, and group or family *uredineæ*, parasitical on plants, particularly on grasses, and notable for the great abundance of dark-colored spores which they throw off. The name smut, although somewhat variously used, is now very generally limited to the genus *ustilago*, in which the character just mentioned, of the profusion of dark-colored spores, is very remarkable. The name smut is often given to *ustilago segetum*, or *uredo segetum*, also called **DUST-BRAND**, a species very common and destructive, parasitic on wheat, barley, oats, and rye (see **ERGOT**), at the base of the germs and glumes, causing the death of the inner parts of the flower, and then converting the whole into a sooty dusty mass. At first, a fine mycelium alone is seen, which ere long produces spores. There is no disagreeable smell, as in some of the allied fungi. A remarkable kind of smut infests maize, swelling the ears to an enormous size, sometimes even a foot in length. No remedy or preventive is known for smut. It does not seem to be communicated through infected grains; but perennial plants attacked by fungi of this kind remain diseased.

SMYRNA, one of the most ancient and important cities of Asia Minor, and the only one of the Greek cities on the western coast which has retained its name and importance to the present day. The early history of Smyrna is very obscure: varying accounts represent it either as originally an Ionian colony, or as having been at first an Æolian city, which, by an act of treachery, fell into the hands of Colophonian (Ionian) exiles, and subsequently, about 700 B.C., formed part of the great Ionian league. This earliest city of Smyrna, known among the Greeks as "Old Smyrna," was situated on the banks of the little river Meles, on the n.e. side of the Hermæan gulf, now the gulf of Smyrna, and claimed the honor of being the birthplace of Homer; and here, near the source of the river, a grotto was shown, in which he was said to have composed his poems. This old city of Smyrna was destroyed, we are told, by the Lydian king Alyattes, and the place remained deserted and in ruins till after the Macedonian conquest,

when the city was rebuilt at the distance of between 2 and 3 m. s. of its original site. This city of "New Smyrna" was founded by Antigonos, and enlarged and embellished by Lysimachus; it was laid out with great magnificence, and adorned with several fine buildings, among which was the *Homereum*, where the poet was worshiped as a hero. The city had an excellent harbor; and from its admirable situation, soon became one of the finest and most flourishing in the world. In the early history of Christianity, Smyrna holds a distinguished place as one of the seven churches addressed in the Apocalypse, and as the scene of the labors and martyrdom of its first bishop, Polycarp. After various vicissitudes during the middle ages, it fell finally into the hands of the Turks, in whose possession it has since remained—the most flourishing city of the Levant.

The modern city of Smyrna (Turkish *Izmir*) occupies the site of New Smyrna, being built partly on the plain at the head of the gulf, partly on the declivity of a hill, the ancient Mons Pagus, and, from the sea, has an attractive appearance. There are some good quays, and some handsome buildings of stone; but the greater part consists of low wooden houses, for the most part of one story high; and the streets, with a few exceptions, are ill-paved, narrow, crooked, and dirty. The city, however, in these respects is better than most other Turkish towns, and improvements have of late years been made. The pop. is estimated at 225,000; of whom about one-half are Greeks, and the rest Turks, Jews, Armenians, and Franks. As is usual in Turkish towns, each people has its separate quarter. Smyrna contains several Greek, Armenian, Roman Catholic, and Protestant churches, and several mosques. There are six journals published here in five different languages. The harbor is excellent; ships of large burden anchor close to the quays; and the trade is most important and extensive. A railway, 81 m. long, constructed mainly with English capital and by English engineers, has been recently opened to Aidin, an important inland commercial town, and is now in operation. Another railway, extending 61 m. inland (to Cassaba), was finished in 1866, and afterward extended to Philadelphia (Alasher). The chief imports are woolen, cotton, and silk fabrics, the metals, leather, nails, machinery, earthenware, building stones, glass and hardware goods, coffee, sugar, spirits, etc. The exports consist of wool, cotton, silk, carpets, hides, opium, copper, wheat, rice, oil, drugs, and gums, figs, raisins, and many other articles. The city and its territory are governed by a pasha. Of the ancient cities not much remains. Some slight ruins mark the site of Old Smyrna. Of New Smyrna some remnants of the massive walls on the hill s.e. of the city are still to be seen.

SMYRNA, GULF OF, an inlet of the Ægean sea, on the w. coast of Asiatic Turkey, is so called from the city of Smyrna (q.v.), which stands at its head. It is 40 m. long, is about 20 m. in greatest breadth, and contains several islands.

SMYTH, a co. in s.w. Virginia; drained by the three forks of the Holston river; traversed by the Norfolk and Western railroad; about 450 sq. m.; pop. '90, 13,360, chiefly of American birth. The surface is mountainous and covered with forests, but the valleys are fertile; wheat, oats, cattle, and pork are the staples. Co. seat, Marion.

SMYTH, CHARLES PIAZZI, b. 1819, Naples; for some time employed in the observatory at the cape of Good Hope, and afterwards appointed royal astronomer of Scotland. He has long studied the great pyramid of Egypt, which, he maintains, was built by divine inspiration as a standard of weights and measures. He has advocated this peculiar theory in several books, such as *Our Inheritance in the Great Pyramid* (1864), *Life and Work at the Great Pyramid* (1867), and *Antiquity of Intellectual Man* (1868).

SMYTH, EGBERT COFFIN, D.D., b. Brunswick, Me., 1829; bro. of S. P. N. Smyth. He graduated at Bowdoin coll., 1848, and studied divinity in the seminaries at Bangor and Andover, and in the univ. of Berlin. Having entered the Congregational ministry, he was a prof. in Bowdoin Coll., 1854-63, when he became prof. of ecclesiastical history at Andover. Since 1878 he has been president of the Andover faculty. He has made large contributions to current denominational literature, and is editor of the *Andover Review*.

SMYTH, JOHN, 1552-1612, b. England; graduated from Christ's college, Cambridge, 1575; took orders and became a fellow, but joined the Puritans after receiving a rebuke for advocating a Judaic observance of Sunday. He went to Amsterdam in 1606, became a Baptist, and was engaged in controversies with Ainsworth and others. He wrote several theological and controversial treatises, such as *A True Description of the Visible Church; The Character of the Beast*, etc.

SMYTH, SAMUEL PHILLIPS N., b. Brunswick, Me., 1843; bro. of Prof. Egbert C., of Andover; educated at Bowdoin coll. and at Andover theol. sem. During the war he was first lieut. of the 16th Me. vols. He was ordained to the Cong. ministry, and was pastor of the First Cong. church, Bangor, Me., 1870-74; First Pres. church, Quincy, Ill., 1875-82; and has been pastor of the First Church of Christ (Cong.), New Haven, Conn., since 1882. Dr. S. is widely known as one of the chief exponents of the "new theology." His works include *The Religious Feeling; Old Faiths in New Lights; Orthodox Theology of To-day; The Reality of Faith; Christian Facts and Forces* (1887).

SMYTH, WILLIAM HENRY, 1788-1865; b. England; son of a loyalist of the American revolution, of New Jersey; descended from Capt. John Smith; entered the British navy, 1805; served at Cadiz, 1810. He made a hydrographical survey of the coasts of Sicily,

and published *Atlas and Descriptive Memoir on Sicily*, 1824; made a survey of the coasts of the Adriatic, 1817, and of the Mediterranean, 1821; post. capt., 1824; rear admiral, 1853. He owned an astronomical observatory at his residence in Bedford, and another at his place in Cardiff. He was president of the Royal astronomical society, and hydrographer to the admiralty.

SNAIL, *Helix*, a genus of gasteropodous mollusks of the family *helicidae*, having generally a sub-globose, sometimes a depressed, spiral shell; the mouth of the shell more or less encroached upon by the last whorl but one, strengthened with an internal thickened rib, its edges more or less reflexed; the *foot* of the animal long, and pointed behind; the tentacles four, the lower pair much smaller than the upper; the tongue armed with many—often from 100 to 200—longitudinal rows of teeth. The species are very numerous, more than 1400 having been described; besides fossil species, of which also there are many. Some of the groups have been constituted into separate genera by recent authors, but all retain the popular name snail, which is indeed often extended to all the *helicidae*. As an instance of the general distribution of snails, it may be noticed that *helix aspersa*, one of the common garden-snails of Britain, is found very generally throughout Europe, great part of Asia and the n. of Africa, and in South America.—Snails feed chiefly on vegetable substances, although they are very indiscriminate in their appetite, and even devour the dead of their own kind. The mischief which they do to garden-crops is too well known; and gardeners lay down cabbage-leaves and the like to attract them, in order that they may be destroyed; any greasy substance increasing the attractiveness of the bait.—Snails delight in warm moist weather; in dry weather their chief time of activity is during the night, and they hide themselves by day; but after rain they come forth at any hour in quest of food. At the approach of winter, or in very dry weather, they close the mouth of the shell with a membrane (*epiphragm*), formed by the drying of the mucous substance which they secrete, and become inactive and torpid. Some, as the edible snail (*H. pomatia*), make a succession of such membranes; the outer one of which is also strengthened by a quantity of calcareous matter, the secretion being at first a white viscid fluid, but quickly hardening like plaster of Paris. When this is to be removed, a fresh secretion of fluid mucus softens it at the edges. Snails retreat into crevices for the winter, or into holes which they make in the earth, and which are roofed over with earth, dead leaves, etc., agglutinated by secreted mucus.—Snails are hermaphrodite, but mutual impregnation takes place, and when they are about to copulate they excite each other by pricking or even piercing with a sharp, calcareous, glass-like style, affixed to a peculiar muscular sac which serves for its protrusion, and which is produced by recent secretion, not being found in them on dissection, except at the season of reproduction. Extraordinary as this circumstance is, it has been the subject of much exaggeration, and in works on natural history not of very old date we read of snails throwing darts (*spicula amoris*) at each other, all which appears to be merely fabulous, although it is probable that the calcareous style may be often broken off in its use. The eggs of snails are round, and enveloped in a skin; they are generally deposited in little clusters. The eggs of the common garden-snails of Britain are about the size of peas, and are deposited just under the surface of the soil.—Snails possess in a very high degree the power of repairing injuries, not only of the shell—although the removal of the whole shell is fatal to them—but also of the soft parts. When the tentacles are cut off, they grow again; and even if the head is cut off, a new head is produced.—We do not think it necessary to describe any of the common British species, as there is nothing of peculiar interest connected with any of them; and the rarer and smaller species have still less claim to notice. The **EDIBLE SNAIL** (*H. pomatia*) of the s. of Europe is the only one that deserves to be particularly mentioned. It is found in the chalk and oolite districts of the s. of England, where it is said to have been introduced from the continent in the 17th c.; but this is very doubtful. It has a shell about 2 in. in diameter and 2 in. in height, whitish or pale tawny, with four darker bands, often not very distinct. It was much esteemed as an article of food by the ancient Romans, who fattened their snails in inclosures (*cochlearia*) made for the purpose, feeding them delicately on meal and boiled wine. It is still in much esteem for the table in various parts of Europe, and is occasionally used in England. Nor is it the only species so used; the common garden-snails are probably equally good, although not so large, and “the glassmen at Newcastle once a year have a snail-feast; they generally collect the snails in the fields and hedges.” Snails of different species are also an article of exportation on a small scale from England to the United States, packed in old casks, in which they are conveyed very well, fixing themselves one upon another to the cask, and leaving a vacant space in the center. Snails boiled in milk are popularly regarded as a remedy for diseases of the chest, and for this purpose they are brought to Covent Garden market. If any benefit results from the use of them, it is probably due to their nutritious qualities.—Some of the tropical species of *helix* are very large, and some have very beautiful shells. See *illus.*, *MOLLUSKS*, vol. X.

SNAKE, a term synonymous with serpent.—The name **COMMON SNAKE** is very generally given in England to a species very abundant in most parts of that country, and throughout Europe from the s. of Scandinavia to the Mediterranean, although there is

only one doubtful instance of its having been found in Scotland. Its range extends also over great part of the n. of Asia. This species (*natrix torquata* or *tropidonotus natrix*) is also known as the RINGED SNAKE and the GRASS SNAKE. It belongs to the family *colubridæ*, and to a section of it which some naturalists constitute into the family *natrixidæ*. It grows to the length of 4 and even 5 ft., although specimens exceeding 3 ft. are rare. The female, as in serpents generally, is much larger than the male. The head is ovate, the muzzle rather narrow, the back part considerably broader than the neck; the body thickens toward the middle, and again tapers toward the tail, which is about one-fifth of the entire length, tapering to a rather sharp point; the gape is wide; the upper part of the head covered with large plates; the scales of the back have an elevated keel; those of the sides are larger, the keel merely rudimentary; the belly is covered with broad oblong plates; the under part of the tail has plates arranged in two rows. The teeth are very small, directed backward, and arranged in two rows on each side of the jaws. The upper parts are grayish brown, tinged with green; at the back of the head are two crescent-shaped bright yellow spots, forming a kind of ring or collar; immediately behind these are two broad black spots, sometimes confluent. Two rows of small black spots are arranged alternately down the back, and larger ones at the sides; but these vary much in size and other particulars. The belly is pale lead color, often marbled with black. The outer skin is changed at intervals varying according to the weather and other circumstances. Mr. Bell says: "I have known the skin shed four or five times during the year. It is always thrown off by reversing it; so that the transparent covering of the eyes, and that of the scales also, are always found concave in the exuvie. Previously to this curious circumstance taking place, the whole cuticle becomes somewhat opaque, the eyes are dim, and the animal is evidently blind. It also becomes more or less inactive, until at length, when the skin is ready to be removed, being everywhere detached, and the new skin perfectly hard underneath, the animal bursts it at the neck, and creeping through some dense herbage, or low brushwood, leaves it attached, and comes forth in far brighter and clearer colors than before." This snake is partial to damp situations, and often enters water, in which it swims with great ease, moving with singular gracefulness. It sometimes remains at the bottom for a considerable time. It sometimes climbs trees, its body, when ascending the stem, being "straight and rigid as a stick." See SERPENTS. It is very voracious; its food consists of frogs, small birds and quadrupeds, etc. Its teeth being incapable of tearing, cutting, or masticating food, the prey is always swallowed entire and living. Mr. Bell heard a frog emit a cry some minutes after it had been swallowed by a snake. The snake has no poison-fangs. It has another kind of defensive armor, in certain glands, which emit a volatile substance of most offensive and penetrating odor, which, like that of the skunk, can hardly be removed from the skin or clothes. No such odor is emitted except in moments of irritation or other passion. The common snake is oviparous: its eggs—usually about fifteen or twenty in number, whitish, with a parchment-like skin, and united into a string by a glutinous substance—are deposited in moist and warm situations, often in dunghills. The mother is said sometimes to coil herself around them, but generally leaves them unregarded. This snake is capable of being tamed, and becomes familiar with those who are kind to it, while the approach of a stranger, of a dog or cat, alarms it, and causes an emission of stench. In winter, it seeks some refuge from severe cold, and becomes lethargic or dormant. Large numbers of snakes often take refuge in one hole; but seldom so many as in an instance recorded by Dr. Carpenter, in which about 1300 were found in an old lime-kiln.

Much interest was excited in 1862 by the discovery in England of a species of snake, *coronella lavis* (see CORONELLA and SERPENTS), previously unobserved in Britain, but common in the middle and s. of Europe, and sometimes distinguished by the name of AUSTRIAN SNAKE, sometimes by that of SMOOTH SNAKE, none of the scales being ridged or keeled, as in the common snake. It inhabits much drier situations than those affected by the common snake, where it is often found in company with the sand lizard, situations more resembling those in which the viper is found. This snake is also more similar to the viper in form and appearance than the common snake, and these circumstances have probably led to its being often mistaken for the viper, and its existence in England remaining unnoticed so long. It attains a length of about 2 ft.; is of a shining brown color, ornamented with checkered irregular patches of black; a yellow mark on the back and sides of the head; the lower parts yellowish, with square black spots. The head is not flattened, as in the viper, but is narrowed in a similar way toward the neck; there is much difference in the plates of the head; the yellow mark on the head is a very characteristic distinction, and the back does not exhibit a broad zigzag pattern, as in the viper. Unlike the common snake, the *coronella lavis* is ovoviviparous, the eggs being hatched within the mother.

SNAKE-BIRD. See DARTER.

SNAKE-EEL, the popular name of the fishes forming the family *ophisuridæ* of some naturalists, included by others, with all the eels, in the family *muraenidæ*, and distinguished by the want of a tail-fin, and the tail ending in a conical point like that of a serpent. They are inhabitants of the seas of warm climates. One species, *ophisurus serpens*, is found in the Mediterranean. It attains the length of about 6 ft., and the

thickness of man's arm; is brown above, silvery beneath, and has a slender and pointed snout.

SNAKE RIVER, also called **LEWIS'S FORK**, is the great southern branch of the Columbia (q.v.). See **IDAHO**.

SNAKE-ROOT. See **ARISTOLOCHIA**; **POLYGALEÆ**.

SNAKE-STONES, small round pieces of stone or other hard substance, popularly believed to be efficacious in curing snake-bites. A belief in their efficacy has been long and very widely diffused, and probably extended to Britain and other western parts of the world from the east. Small perforated balls and rings of various kinds of stone, ivory, etc., strung together like beads, were formerly used as snake-stones in Scotland, being given to cattle to chew when they were bitten by vipers. Of course they could only be expected to act as a kind of charm. Many of the snake-stones used in India and the further east seem to be of no greater value. Some of them, however, appear to be really efficacious, being applied to the wound and absorbing blood from it with the poison before it has entered the system. Remarkable instances are related of speedy cures thus effected. The snake-stone adheres for a short time to the wound, and then falls off. The wounded limb is meanwhile rubbed downward. Two small snake-stones, each the size of a large pea, brought from India, and which were known to have cured a man bitten by a cobra, were found by Mr. Quekett to be composed of some vegetable matter. Another, also known to have cured a cobra's bite, having been brought from Ceylon by sir James E. Tennent, was examined by Mr. Faraday, and was deemed by him to be "a piece of charred bone, which has been filled with blood, perhaps several times, and then carefully charred again." —See Buckland's *Curiosities of Natural History*, and Tennent's *Ceylon*, vol. i.

SNAKE-WEED, another name of **Bistort** (q.v.).

SNAKE-WOOD, another name of **Letter-wood** (q.v.).

SNAPDRAGON, *Antirrhinum*, a genus of plants of the natural order *Scrophulariaceæ*, consisting of annual and perennial herbaceous plants, chiefly natives of the temperate parts of the northern hemisphere. They have the calyx 5-parted; the corolla swollen at the base, but without a spur, and *personate* (Lat. *persona*, a mask), i. e., its mouth closed by the pressure of the lower against the upper lip; and the fruit is a 2-celled oblique capsule, opening by three pores at the apex. The English name refers to a peculiarity of the corolla, the lower lip of which, if forcibly parted from the upper, so as to open the mouth, shuts with an elastic spring or snap. Some of the species have very pretty flowers. *A. majus* has long been a favorite in our gardens, in which there are many fine varieties of it.

SNAPHAUNCE, an old musket of the 17th and first half of the 18th c., called also **Asnaphan**. See **LOCK**.

SNAPPING-TURTLE, a name applied in the United States to different species of tortoises. The best known is the *chelydra serpentina*, of the northern, and most of the southern states, inhabiting small streams and marshes. It is said to sometimes attain a length of 4 feet, and to weigh 50 lbs. Its more common size is from 8 to 15 lbs. It has an immovable plastron, a large head, and is very fierce, snapping at its enemies, and its food. Another kind of snapping-turtle, known in the southern states, extending from Florida to western Texas, and up the Mississippi and Missouri rivers is the *macrolemys temminckii*, generally known as the alligator-turtle. It is said to sometimes attain a weight of 100 lbs. Both of these species belong to the family *chelydridæ*, and are distinguished from all other turtles of the United States by the long and imperfectly retractile neck and tail, and the cruciform plastron or lower shell. Both these turtles are used as food, and by some are highly prized for making soup; but they are inferior to the sea-turtle. The name of snapping-turtle is sometimes applied to soft-shelled turtles of the family *trionychidæ*, because they also snap at their food and other objects.

SNEE HÄTTEN. See **NORWAY**.

SNEEK, a prosperous trading and manufacturing t. in the Netherlands, province of Friesland, 13 m. s.s.w. of Leeuwarden. It is built in the form of an irregular triangle, has three canals, and good water-way to the sea. There are a number of manufactures of metal wares, bricks, etc., and a trade in wheat, butter, cattle, etc., and some shipping. Rich meadow-lands, in some places tending to be marshy, surround the town, and in the neighborhood is a considerable lake called the Sneekermeer. Pop. '89, 11,469.

SNEEUWBERGEN, a range of mountains in Cape Colony, South Africa, forming the eastern extension of the Roggeveld and Nieuveland ranges. See **CAPE OF GOOD HOPE**.

SNEEZE-WOOD, *Pteroxylon utile*, a tree of the natural order *sapindaceæ*, a native of South Africa, common in the eastern districts of Cape Colony. The timber rivals mahogany in beauty, takes a fine polish, is very solid, strong, and durable. It receives its English name, and its Dutch name, *nieshout*, from the sternutatory properties of its sawdust, by which workmen are often much annoyed.

SNELL, EBENEZER STRONG, LL.D., 1801-76; b. Mass., graduated at Amherst college, where he remained continuously an instructor for over 50 years, and since 1834 prof. of mathematics and natural philosophy. He edited several text-books.

SNELL, WILLEBRORD, 1591-1626; b. Leyden, son of Rudolph Snell, was professor of mathematics at the university at Leyden, succeeding his father, and the discoverer, according to Huygens and Vossius, of the law of the refraction of light attributed to Descartes. He was a friend of Kepler. He published (1617), *Eratosthenes Batarus sive de Terre Ambitus vera Quantitate*, describing his method of calculating the size of the earth, and *Cyclometria* (1621).

SNELL EXHIBITIONS. These exhibitions were founded in the year 1677 by John Snell of Uffeton, in the county of Warwick, for the purpose of educating Scottish students at the university of Oxford. Snell was born in the parish of Colmonell, in Ayrshire, in 1629, and entered the university of Glasgow in 1644. He afterward removed to England, where, after holding several offices of a legal nature, he was appointed seal-bearer to the court of chancery. He died at Holywell, near Oxford, in 1679, leaving his estate of Uffeton, near Leamington, to trustees (the vice-chancellor of the university of Oxford, the provost of Queen's college, the master of Balliol college, and the president of St. John's college), for the foundation of the scholarships which bear his name (at present 14 in number). The exhibitions have been the subject of much litigation in the court of chancery, and are now administered under a scheme settled in 1861. The exhibitors are nominated by the college of Glasgow, and received about £110 annually each during five years. Candidates for these scholarships must have been in born in Scotland, or must be sons of fathers born in Scotland, and must have resided for two years at least in Glasgow college, or for one year in that college, and two at least in some other college in Scotland. None are admitted to examination who have completed their 21st year, or have been members of the university of Oxford of more than two years' standing from the day of their matriculation inclusive.

SNELLING, WILLIAM JOSEPH, 1804-48; born in Boston; graduated at West Point; successively fur-trapper and lead miner in the west, journalist in the east, and editor *Boston Herald*; pub. *Truth*, a satirical poem, *Tales of the Northwest*, *Polar Regions of the Western Continent Explored*, etc.

SNIA'TYN, a t. of Galicia, in Austrian Poland, is situated on the Pruth, and was formerly a frontier stronghold. It has tanneries and a considerable trade in cattle and horses. Pop. '90, 10,939, among whom are many members of the Armenian church.

SNIDER RIFLE, a form of breech-loader which was adopted in 1866 by the British government, by altering the old Enfield muzzle-loaders in accordance with the Snider system. See **BREECH-LOADING ARMS**.

SNIPE, *Scolopax*, a genus of birds of the family *scolopacidae* (q.v.), having a very long straight bill, with nasal grooves extending almost to the tip, which expands a little, the upper mandible slightly exceeding the lower in length, the whole bill soft and very sensitive, smooth and shining in the living bird, but soon after death becoming pitted like the end of a thumb by drying. The head is compressed; the eyes large, and placed far back in the head, an evident adaptation to the mode of life, enabling the bird to guard against danger, while its bill is plunged in the mud. The feet have three toes before, divided to the base or very nearly so, not edged by membrane, the hind-toe short. The tail is short. The genus naturally divides itself into two sections, sometimes regarded as distinct genera, the first consisting of the woodcocks (q.v.), to which the generic name *scolopax* is appropriated; the second containing the species popularly known as snipes, which receive the generic name *gallinago*, and are distinguished by their lighter form, by their longer legs, and by having a little of the lower part of the tibia bare.—The **COMMON SNIPE** (*S. gallinago*, or *gallinago media*) is about 11 in. in entire length, the bill almost 3 inches. The sexes are alike in plumage, but the female is rather larger than the male. The general color of the upper parts is blackish brown, finely mixed with pale brown and with a rich buff color; three pale brown streaks along the head; the neck and breast pale rust color mottled with black; the belly white. The tail consists of 14 feathers. The snipe, when flushed, changes its course several times in a zigzag manner in the air, and then darts off very swiftly, so that young sportsmen find it a very difficult bird to shoot. The snipe makes a very inartificial nest of a little dry herbage, in a depression of the ground, or sometimes in a tuft of grass or rushes. The eggs are four in number, pale yellowish or greenish white, the larger end spotted with brown. This species of snipe is plentiful in all the moory and marshy parts of Britain, and generally throughout Europe, also in some parts of Asia, and it is found in the n. of Africa. It breeds in Britain, even in the s. of England, although many of the snipes which spend the winter in Britain migrate northward in spring. The snipe is capable of being tamed, and becomes very familiar, but is difficult to keep from the prodigious quantity of worms and other such food which it requires. A tame snipe has been known to eat nearly twice its own weight of worms in 12 hours. The snipe is in high esteem for the table, and is included among game in America.—The habits of all the other spe-

cies of snipe correspond very nearly with those of the common snipe. The GREAT SNIPE, or SOLITARY SNIPE (*S. or G. major*), is comparatively a rare bird in Britain, but abounds in the extensive marshes of continental Europe, and is found also in Asia. Its entire length is about 12½ in., the bill not quite so long in proportion as that of the common snipe. There are 16 feathers in the tail.—The JACK SNIPE, or JUNCOCK (*S. or G. gallinula*), the smallest of the British species, is like the common snipe in plumage. It is common in Britain, but mostly as a winter visitant, and is found also during summer or winter, in most parts of Europe and of the n. of Asia.—North America has a number of species. The COMMON AMERICAN SNIPE (*S. or G. wilsoni*) is about equal in size to the common snipe of Europe, and much resembles it also in plumage. The tail has 16 feathers. This species is abundant in summer in the northern parts of the United States and in Canada, in the more southern states in winter. It is in much request for the table, and is often caught in snares.—Snipes are found also in other parts of the world. The name snipe is extended in popular usage to include the genus *macrorhamphus*, in which the outer toes are connected at the base by a membrane. In other characters, as well as in plumage and habits, the similarity to the true snipes is very great. The RED-BREASTED SNIPE, or BROWN SNIPE (*M. griseus*), of North America has been occasionally seen in Britain and in Scandinavia. In size it is nearly equal to the common snipe. See *illus., OSTRICH, ETC.*, vol. XI.

SNIPE-FISH. See TRUMPET FISH.

SNIZORT, LOCH, a large and picturesque inlet of the sea, in the n.w. of Skye (q.v.), between Trotternish point and Vaternish point. At its head, the loch is only a few furlongs broad; but it gradually expands, and at its entrance the breadth is over 7 miles. It is 13 m. long.

SNOHOMISH, a co. situated in n.w. Washington, having Admiralty inlet on the w.; drained by the Snoqualimi and Steilacquamish rivers; 1720 sq.m.; pop. '90, 8514 of American birth, with colored. The Cascade range forms its e. boundary, and on its slopes and by the streams are extensive tracts of wood land and groves of fir and spruce. Lumber is the chief source of revenue. Near the inlet are cranberry marshes, and the soil of the plains is adapted to grain and to stock-raising. Co. seat, Snohomish.

SNORRI STURLESSON, a learned historian, and a distinguished Icelandic politician, was b. in 1179 at Hvammi, in Iceland, where his family, who traced their descent to the ancient kings of Norway and Sweden, had been settled since the early colonization of the island. Snorri Sturlesson was placed at an early age under the care of Jon Loptson, the grandson of Sæmund Sigfusson, the learned compiler of the old Edda, by whom he was instructed in the history, mythology, and poetry of the n., as well as in classical literature. By his marriage, at the age of 26, with a rich heiress, and the speedy death of his father, Snorri Sturlesson early attained a position of wealth and influence, and by the free choice of the people, was elected supreme judge, or chief magistrate of the island. In this post, he was distinguished for his profound knowledge of the laws and civil institutions of his native country; but his ambition, avarice, and love of intrigue embroiled him personally in sanguinary feuds, and contributed to hasten the destruction of Icelandic independence. His love of intrigue led him to take part in the intestine troubles of Norway, and thus drew upon him the suspicion and ill-will of the Norwegian king, Hakon, who sent secret instructions to Iceland for his arrest; or, if need be, his assassination. The king's intentions were carried out to their fullest extent; and his numerous enemies joining together in a plot against him, Snorri Sturlesson was attacked in his own house, and murdered in the year 1241. Snorri Sturlesson was a poet of no mean order, and composed numerous *drapas*, or laudatory poems, on the kings and jarls at whose courts he sojourned. His great work is the *Heimskringla*, or Mythic Ring of the World, in which he records the history of the kings of Norway from the earliest times to the death of Magnus Erlingsson, in 1177; and which he compiled from ancient genealogical tables and other documents. It was translated into Danish about 1559 by Peder Clauson, and published first by Olaf Worm (Cop. 1633). This translation has been republished in more recent times by Gruntvig (3 vols., Cop. 1818-22) and others. German, Swedish, and Latin versions have also been executed. Snorri Sturlesson is believed to have had a share in collecting and arranging the songs of the elder or poetic Edda (q.v.), and to have contributed very materially toward the compilation of the *Skalda* and other parts of the younger or prose Edda.

SNOW is the frozen moisture which falls from the atmosphere when the temperature is 32° or lower. It is composed of crystals, usually in the form of six-pointed stars, of which about 1000 different kinds have been already observed, and many of them figured, by Scoresby, Glaisher, and others. These numerous forms have been reduced to the following five principal varieties—1. Thin plates, the most numerous class, containing several hundred forms of the rarest and most exquisite beauty. 2. A spherical nucleus or plane figure studded with needle-shaped crystals. 3. Six or more rarely three-sided prismatic crystals. 4. Pyramids of six sides. 5. Prismatic crystals, having at the ends and middle thin plates perpendicular to their length. The forms of the crystals in the same fall of snow are generally similar to each other. The crystals of hoar-frost being formed on leaves and other bodies disturbing the temperature, are often irregular and

opaque; and it has been observed that each tree or shrub has its own peculiar crystals. Snow-flakes vary from an in. to $\frac{1}{100}$ of an in. in diameter, the largest occurring when the temperature is near 32°, and the smallest at very low temperatures. As air has a smaller capacity for retaining its vapor as the temperature sinks, it follows that the aqueous precipitation, snow or rain, is much less in polar than in temperate regions. The white color of snow is the result of the combination of the different prismatic rays issuing from the minute snow-crystals. Pounded glass and foam are analogous cases of the prismatic colors blending together and forming the white light out of which they had been originally formed. It may be added that the air contained in the crystals intensifies the whiteness of the snow. See RED SNOW. The limit of the fall of snow coincides nearly with 30° n. lat., which includes nearly the whole of Europe; on traversing the Atlantic, it rises to 45°, but on nearing America descends to near Charleston; rises on the w. of America to 47°, and again falls to 40° in the Pacific. It corresponds nearly with the winter isothermal of 52° Fah. Snow is unknown at Gibraltar; at Paris, it falls 12 days on an average annually, and at St. Petersburg 170 days. It is from 10 to 12 times lighter than an equal bulk of water. From its loose texture, and its containing about 10 times its bulk of air, it is a very bad conductor of heat, and thus forms an admirable covering for the earth from the effects of radiation—it not unfrequently happening, in times of great cold, that the soil is 40° warmer than the surface of the overlying snow. The flooding of rivers from the melting of the snow on mountains in summer, carries fertility into regions which would otherwise remain barren wastes. See GLACIER.

SNOW-BALL TREE. See GUELDER ROSE.

SNOWBERRY, *Symphoricarpos*, or *Symphoria racemosa*, a bushy deciduous shrub of the natural order *caprifoliaceæ*, a native of the northern parts of North America, and now very common in British shrubberies. It has simple leaves and small flowers; berries about the size of black currants, remaining on the bush after the leaves, quite white, but uneatable.—The name SNOWBERRY is also given to *Chiogenes hispidula*, a native of the bogs of North America.

SNOW-BIRD, *Junco*, or *Fringilla hyemalis*, a North American bird of the finch family (*fringillidæ*), common from Louisiana to the fur countries, in all the eastern parts of North America. The wings are rather short, the tail slightly notched. The whole length is rather more than 6 in.; the upper parts are lead-color, the lower parts white, the two outer tail-feathers white, the next white margined with black. This bird migrates northward early in spring, and southward late in autumn. It is often to be seen in small flocks, visiting barn-yards, and hopping about with the domestic poultry. In cold weather, it retires to holes in haystacks. Its song is sweet. From its frequent familiar approach to human habitations, the snow-bird is regarded with favor throughout great part of North America, as the redbreast is in Britain. In the s., however, it is often brought to market. A similar species is the OREGON SNOW-FINCH (*P. Oregona*).

SNOW-BUNTING, or SNOW-FLECK, *Plectrophanes nivalis*, a bird of the bunting family (*emberizidæ*), of a genus distinguished from the true buntings by the long and nearly straight claw of the hind-toe, in this resembling the larks. There is also an approach to larks in habits; there is a similar ease and celerity in running along the ground, and the song is very different from that of any of the true buntings. The snow-bunting abounds in summer in all parts of the arctic regions, and in winter in more southern countries of Europe, Asia, and America. Linnæus says it is the only living creature that has been seen 2,000 ft. above the limits of perpetual snow on the mountains of Lapland.

SNOWDEN, JAMES ROSS, 1810-78, b. Pa.; was numismatist; speaker house of rep., Pa., 1842-44; state treasurer, 1845-47; treasurer U. S. mint, 1847-50; director, 1853-61; pub. *Description of Coins in the U. S. Mint* (1860), *Coins of the Bible* (1864), etc.

SNOWDON, a mountain-range in Caernarvonshire, n. Wales, stretches in a n.e.n. direction from a point 5 m. n. of Criceith, near the head of Cardigan bay, to near Conway; but is broken up by valleys and river-courses into four mountain groups, whose chief peaks are Carnedd-Llewelyn, 3,482 ft.; Moel-Siabod, 2,865 ft.; and Moel-y-Wyddfa ("the conspicuous peak"), the highest mountain in s. Britain, 3,588 ft. above sea-level. Seen from the top, Moel-y-Wyddfa, the "King of Snowdonia," appears to send out three ridges, which gradually divide and subdivide, giving birth to numerous valleys and corries. The ascent of the highest peak of Snowdon is effected by tourists from Llanberis (on the n.), Beddgelert (on the s.), Llyn-Cwellyn (on the w.), and Capel Curig (on the e.); the first is shortest and easiest; the last is longest, most difficult.

SNOW-DROP, *Galanthus*, a genus of plants of the natural order *amaryllidæ*, of the same tribe with amaryllis, snowflake, crinum, etc. The three outer segments of the perianth spread, so as to make a bell-shaped flower; the three inner are shorter, erect, and notched at the summit. The flowers arise from a spathe. The root is bulbous, and produces two leaves and one single-flowered leafless stem (*scape*). The common snow-drop (*G. nivalis*), a plant too well known to need description, is a native chiefly of the s. of Europe, growing in woods and pastures. It is found apparently wild in some places both in England and Scotland, but is probably rather naturalized than native. See illus.,

FLOWERS, vol. VI., fig. 32. Another species of snow-drop (*G. plicatus*), with much broader leaves, is found in the s. of Russia and in Asiatic Turkey.

SNOW-DROP TREE, or **SILVER-BELL TREE**, a popular name for a genus of styrax, *Halesia tetrapetala* and *H. diptera*, named after Stephen Hales, author of *Vegetable Statics*. They are shrubs or small trees, with large and veiny pointed deciduous leaves, and showy white flowers, drooping on slender pedicels in short racemes or clusters from axillary buds of the preceding year. Calyx inversely conical, 4-toothed; petals 4, united at the base, or middle, into an open bell-shaped corolla; stamens, 8 to 16; filaments united into a ring at the base; ovules 4 in each cell; fruit large and dry, 2 to 4 winged; seeds single, cylindrical. They are beautiful shrubs for cultivation. A third species grows in Florida, *H. parviflora*.

SNOW-FLAKE, a popular name for the *Leucojum vernum*, *L. aestivum*, and *L. autumnale*, species of European herbs of the amaryllis family which have been introduced into gardens in the United States. They are among the hardy bulbous plants. See **AMARYLLIDÆ**, and **SNOWDROP**.

SNOW-LINE. The snow-line marks that height above the sea-level below which all the snow that falls annually melts during summer; higher than this lies the region of perpetual snow. No general rule for the height of this line can be given, owing to the different causes which may determine it. These are—the situation of the slope in respect of the sun's rays, and hence, other things being equal, it is higher on the s. than on the n. side of mountains; the situation with respect to the rain-bringing winds; the steepness of the slope; and the dryness or humidity of the region. The following are the observed heights of the snow-line in English feet in different parts of the globe:

	N. Lat.	Height.
Spitzbergen.....	78	0
Sulitelma, Lapland.....	67	3,835
Kamtchatka.....	59½	5,249
Unalashka, W. America.....	56½	3,510
Altai.....	50	7,084
Alps.....	46	8,885
Caucasus.....	43	11,063
Pyrenees.....	42¾	8,950
Rocky Mountains.....	43	12,467
North Himalaya.....	29	19,560
South Himalaya.....	28	15,500
Mountains of Abyssinia.....	13	14,065
Purace, Colombia.....	2¼	15,381

	S. Lat.	Height.
Nevados of Quito.....	0	15,820
Arequipa, Bolivia.....	16	17,717
Paachata, Bolivia.....	18	20,079
Portillo, Chili.....	33	1,473
Cordilleras, Chili.....	42¼	6,010
Magellan, Strait.....	53½	3,707

SNOW-PLOW, A, is a machine for clearing roads, railways, etc., of snow. For railways there are several forms, from the smooth iron sides attached to the front of an ordinary locomotive, to the machines of immense size and weight and complicated mechanism. Since the era of Trans-Continental railways much attention has been given to the subject, and several forms have been invented, of which the Rotary Steam Snow Shovel seems to meet with most favor. It has been adopted by all the Trans-Continental lines of the United States and Canada; also by many of the eastern and western Trunk lines. It consists of a wheel nine feet in diameter set in a round casing with a flaring front ten feet square which feeds the snow into the wheel. The wheel contains an inner and outer series of knives pivoted on radial pins, with their surfaces inclined to one another; when they encounter any snow, they are *canted*, or set so as to slice it off and feed it into the machine. Behind the knives is a fan-wheel composed of a number of radial blades. When the wheel revolves, the centrifugal force throws the snow to the outside of the wheel, where it meets the enclosing case, and is forced through an opening just behind the headlight. A hood to this opening regulates the direction in which the snow is thrown. The weight of the machine is about twenty tons. The "Rotary" was invented by Orange Jull, a Canadian, in 1884. The right to build these machines was immediately purchased by a company in Paterson, N. J., and the first one constructed in the United States was by them, in 1885. A trial made of it in Buffalo the same year was considered extremely successful. Another machine much used by various railroads in eastern Canada is the "Russell." Other machines worthy of mention are the Jull Centrifugal Snow Excavator, built in 1889; also the Cyclone Snow-Plow, a powerful machine invented the same year by E. P. Caldwell of Minneapolis, Minn. See *illus.*, **RAILWAYS**.

SNOW-SHOES, a species of shoe much used by the Esquimaux, Laplanders, and others who inhabit those regions where snow prevails for a great portion of the year. It consists of a flat frame, of a lanceolate form, from 8 to 14 in. in breadth at its widest part, and of great length—sometimes as much as 7, though generally about 4 feet. It is either wholly of wood or is a wooden frame filled in with wicker-work or thongs, and has cross-straps on the upper surface to attach it to the foot. The broad surface prevents the foot from sinking in the snow. See illus., *NORTH AND SOUTH AMERICA*, vol. I., figs. 8, 9.

SNUFF. See **TOBACCO**.

SNYDER, a co. in central Penn., bordered by the Susquehanna river on the e., crossed by a branch of the Pennsylvania railroad, drained by Penn's and Middle creeks; 325 sq. m.; pop. '90, 17,651. The surface is mountainous and mostly covered with forests of oak, chestnut and hickory; the soil is fertile. The main productions are wheat, corn, hay, wool, clover-seed, and lumber; cattle, sheep, and swine are raised. It contains large deposits of coal and iron. Carriages, etc., leather, flour, and lumber are manufactured. Co. seat, Middleburg.

SNYDERS, or **SNEYDERS**, **FRANS**, a Belgian artist, celebrated for his powers as an animal-painter, was b. at Antwerp in 1579, and was formed in the school of Henry van Baelen. Originally, he confined himself exclusively to painting fruits, and worked with Rubens. In his pictures, with figures by Rubens, Jordaens, Honthorst, and Miervelt, it is difficult to discover any difference of touch. For Philip III. of Spain he executed several hunting and battle pieces. Snyder knew how to give expression to the passions of the lower creation, and his bear, wolf, and boar fights are scarcely surpassable. The best specimens of the artist are contained in the galleries of Vienna, Munich, and Dresden, but there are also some fine pictures of his in private English collections. Snyder died at Antwerp in 1657.

SOAP (Lat. *sapo*(n), Welsh *sebon*—the Romans considered soap to be a Celtic invention). This well-known material, according to Pliny, first became known to the Romans by their conquest of Gaul. There are some notices of it in the English version of the Bible, but it is believed that the words *borith* and *nether*, there rendered into soap, really mean potash and soda.

The *chemical composition* of soap may be explained as follows: The fixed fatty bodies, stearine, palmitine, and oleine (we do not include margarine, for it is now generally admitted that the fat to which this name was applied is merely a mixture of stearine and palmitine), when heated with alkaline solutions, undergo the remarkable change known under the title *saponification*, or conversion into soap, during which process the fats yield up a clear viscid liquid, which, from its sweetness, is termed *glycerine* (q. v.). The nature of this change may be ascertained by decomposing the soap that is thus formed, and which exists as a homogeneous transparent mass, freely soluble in warm water, by the addition of some acid, such as tartaric or hydrochloric, which combines with the alkali, and forms a soluble compound with it. A fatty matter separates in flakes, which melt on the application of heat, and form an oily layer on the surface of the fluid. This substance, when cold, is found to be very different from the original fat. It has acquired a strongly acid reaction, as may be ascertained by applying test-paper to it in its melted state, and it is freely soluble in alcohol, the solution being strongly acid. It at once forms a clear solution in hot alkaline liquids, while the original fat would under similar conditions have formed a milky-looking fluid. It is, in fact, a true *acid*, capable of forming salts, the potash and soda salts being known as *soft-soap* and *hard-soap*, which have been thus generated out of the elements of the neutral fat would under the influence of the alkali. Stearine, when thus treated, yields *stearic acid* (q. v.); palmitine yields *palmitic acid* (q. v.); and oleine, *oleic acid* (q. v.); while common fat, which is a mixture of the three above-named fats, affords, on saponification with an alkali, and subsequent decomposition of the soap, a mixture of the three fatty acids.

The term soap is sometimes extended in meaning, so as to include compounds of the fatty acids with other bases besides the alkalies, e. g., lime, baryta, magnesia, etc.; but these compounds being insoluble are inapplicable to the purpose of cleaning. The true soaps owe their cleaning power to their solubility, and their attraction for the matters that ordinarily constitute "dirtiness." The presence of a portion of free alkali increases the detergent power, especially in the case of greasy matter.

Manufacture.—In Great Britain, and in the n. of Europe generally, hard-soap is made from tallow, palm-oil, bone grease, and kitchen fat, by boiling to saturation with caustic-soda. Cocoa, palm nut, and some other oils are occasionally used, chiefly in imitating superior soaps, and the only other ingredient of consequence is rosin, the residuum of the distillation of rough turpentine. In the s. of Europe, coarse olive-oil is the staple material, and from this is produced the marbled soap known as "Marseilles."

The soap-maker first dissolves in boiling water 6 to 8 cwt. of crude soda-ash (see **SODA**) in a cast-iron circular vessel (contents may be 1000 gals.), furnished with a steam-pipe in its center. He then adds half the weight of *pure caustic lime*, and boils the mixture. When the lime has rendered the soda caustic, the boiling is discontinued, subsidence takes place, and the lye is ready for use.

Soap-pans are of various sizes. One of moderate dimensions may turn out from six

to eight tons, and is usually formed of four pieces of cast-iron—lower casting, say five feet in diameter; upper, eleven. Heat is applied either by means of a furnace beneath the bottom piece, or by open steam introduced by a pipe led to a circular perforated ring at the bottom of the pan. Steam boiling being now extensively adopted, our description will apply to that method.

Curd or White Soap.—20 cwt. of tallow being put into the soap-pan, and a quantity of the prepared lye, steam is turned on, and boiling continued until the lye is thoroughly incorporated with the tallow, and becomes a pasty mass. A few shovelfuls of common salt are now thrown in when the lye begins to separate. The partially formed soap is allowed to cool, and the salted lye, now deprived of its soda, subsides, and is drawn off from the bottom by a pipe, or removed by a pump. The operation of adding and boiling with lye is repeated until the tallow is saturated with soda, and the lyes show as much alkali after boiling as before. The soap is now treated with weaker lye, and by more or less water brought to the consistency the maker requires. From its tendency to thicken rapidly, it is transferred to the frame at a higher temperature than the soap next described.

Pale or Yellow Soap.—When the tallow is saponified as above described, about one-third of its weight of rosin is added, and the boilings with lye repeated, until the mass is thoroughly saponified. The practiced workman being aware that perfect soap is insoluble in strong alkali, avoids the risk of imperfect particles escaping the action of the lye from being enveloped in perfect soap, by reducing the mass with water, and adding lye gradually until the soap again floats as a curd on the liquid. The soap is then cooled down, and the lye being removed as completely as possible, it is boiled with the quantity of water necessary to bring it to the consistency required. These later operations require much experience, and the best theoretical knowledge requires the aid of tongue and eye to carry them through with success. The soap being now *finished* (the technical term), the copper is covered up, and the contents allowed to settle until the temperature falls to about 160° Fahrenheit. According to the quantity of water used, so is the deposit, called the *nigre*, greater or less. When too much water is used, the produce of soap is too small; when too little, the produce is large, but of inferior quality, from the insufficient deposit of impurities. This *nigre* is employed in making second-class soap. When of proper temperature, the soap is removed, into frames, now mostly made of cast-iron, containing about 10½ cwt. each, where, after solidifying, which it does in three days, it is cut by wire into slabs, which are again cut transversely into bars ready for the market.

London mottled is made of kitchen fat (no rosin). The process described in the making of curd soap is followed here, except that when perfect the soap is, when almost boiling, put into wooden frames three or four times as high as the ordinary frame of 52 in., and the lye allowed to percolate through the soap to the lower part of the frame, producing the mottled appearance desired. As this soap, when subjected to any mixing operation, lost its *mottle*, it long enjoyed a high reputation as a genuine soap; but now that cheap imitations, having a beautifully marbled appearance, are produced from cocoa and palm nut oils, with coloring and siliceous matter, its prestige is somewhat on the wane.

The numerous patents taken out for improvements in soap-making have had for the most part more the object of cheapening, by the addition of various articles to soap in its semi-fluid state, than of improving the manufacture.

Soft-soap differs from hard from having potash for its base instead of soda. The repeated changes of lye described in the manufacture of hard soap are here inadmissible, for all the lye employed remains in combination with the oily materials, and is never separated. Hence open steam, as throwing in water into the mass, cannot be applied, nor can salt, so useful an agent in the former manufacture, be used, as it would tend to separate the soap from the lye, while a thorough combination is essential. The making of soft-soap requires much experience and nicety, it being so easy to overdo the supply of alkali, which cannot happen in hard-soap. A ton of materials, consisting of 1900 lbs. of fish or other oil, with 340 lbs. tallow, is put into the soap-pan with 200 gallons of American potash lye of such strength that 6,600 grains of real potash are in each. After being boiled by the heat of a furnace, and well beat down on the surface to keep in bounds the frothy mass, a stronger lye, containing about 8,700 grains of potash per gallon, is added at short intervals, and the boiling carried on until the workman ascertains by taste and appearance that the soap is perfect. The tallow serves to give consistency to the soap, and also produces white specks of stearate of potash, which much enhance its appearance.

SOAP, MEDICAL USES OF. The only kind of soap that should be used internally is *white soda soap*. It is prepared from caustic soda and either olive or almond oil. In its purest state it is called *medicinal soap*, while in its less pure forms it is known as *Allicant*, *Venice*, or *Spanish soap*. When properly made, it should be perfectly soluble in pure water and in alcohol. It is chiefly employed to form pills of a gently aperient and ant-acid action. Pills containing a combination of soap and dried carbonate of soda are of great use in certain forms of gravel. Soap is often added to pills as an adjuvant, or for the purpose of preventing them from becoming hard and insoluble. White soap affords a ready antidote in cases of poisoning with the strong mineral acids. *Soft-soap* ought to

be made with olive oil and potash, and it should be of yellowish-white color, inodorous, and of the consistence of thick honey. It is of great service as an external application, either alone or in association with sulphuret of potash and other remedies, in various cutaneous affections.

SOAPBERRY, *Sapindus saponaria*, a West Indian tree of the natural order *sapindaceæ*, the pulp of the fruit of which is used instead of soap in washing. This property belongs to other species of the same genus. With the exception of *S. marginatus*, found in the southern states of North America the genus is entirely tropical. The use of the pulp as soap, if often repeated, is apt to injure linen; but it is capable of cleansing as much linen as sixty times its weight of soap. Each fruit contains a nut of a shining black color. These nuts are very hard, and were formerly imported into Europe to be made into waistcoat buttons, being tipped with silver or other metal. They were little liable either to be injured by wearing or to be broken.

SOAP-STONE. See **STEATITE**.

SOAP-TEST. This test, for which science is indebted to Prof. Clark of Aberdeen, is now universally employed for determining the degree of hardness of water. Every one knows how much more readily a lather is formed—as, for example, in washing the hands—with soft than with hard water. This is accounted for by the earthy bases of the hard water displacing the alkaline bases of the soap, and forming compounds insoluble in water. This is the foundation of the soap-test. A hard water of known strength is first prepared by dissolving 16 grains of pure carbonate of lime in pure hydrochloric acid, evaporating to dryness, and dissolving the resulting chloride of calcium in a gallon of distilled water. This gallon of chloride of calcium solution accurately represents a natural water whose hardness is due to 16 grains of carbonate of lime in a gallon. A solution of soap in proof-spirit is next prepared of such strength as that a quantity of it which will fill 32 measures of a volumetric tube, each measure of which contains 10 grains, will be exactly able to convert 1000 grains' measure of the standard solution of hard water into the earthy soap described. This point is thus ascertained: The hard water is placed in a stoppered bottle, and the soap solution added to it by degrees, the bottle being shaken after each addition, when a bubble will form, which rapidly disappears so long as any lime is present; but when at last it is all used up, a froth of soap bubbles remains after hard shaking, such as to last unbroken for three minutes. If, now, a given sample of water be examined, and this point is reached at the expense of the entire 32 measures, it is a water of 16 degrees of hardness. Now, perfectly soft water consumes 2 measures of the soap solution before permanent bubbles are formed, so that a water of 16 degrees of hardness has in reality only consumed 30 measures of the soap solution. But $\frac{16}{30} = 0.53$;

hence, if any given measures of the soap-test be used in estimating the hardness of a water, we must first subtract 2 from the amount, and then multiply by 0.53; and the result will give us the degree of hardness. For example, let a given sample require 27 measures of the soap-test. On subtracting 2 and multiplying by 0.53, we find its hardness to be 12.25. Clark's Soap-test Table for Hardness of Water is given in the article "Soap-test" in Knight's *English Cyclopædia*; and full details regarding the mode of working the test, to determine the amount of lime, magnesia, soda, sulphuric acid, and pure carbonic acid, are given in Dr. Parkes's *Manual of Practical Hygiene* (Lond. 1864).

SOAPWORT, *Saponaria*, a genus of plants of the natural order *caryophyllaceæ*, having a cylindrical or ventricose 5-toothed calyx, without any outer calyx or attendant bractææ, five undivided petals with long claws, ten stamens, two stigmas, and a capsule opening at the top by four valves. Some of the species have very beautiful flowers. *S. calabrica* has of late become one of the most favorite annuals of our flower-gardens.—**COMMON S.**, Bouncing Bet (*S. officinalis*), is found on waysides, in thickets, and on banks of streams, in most parts of Europe, although it is a somewhat doubtful native of Britain. Both the root and the leaves contain saponine (q.v.), in consequence of which they are sometimes employed for washing. The brownish-red color of the bark of the root, however, is apt to tinge white articles. The root of this plant has also medicinal properties, being aperient, resolvent, and alterative. It is sometimes sold as **RED SOAP-ROOT**.

Nearly allied to the genus *saponaria*, but having an angular calyx and a 5-valved capsule, is the genus *gypsophila*, some species of which are called **SOAP-ROOT**, and contain much saponin. Thus, the **EGYPTIAN SOAP-ROOT** (*G. struthium*), and the **SPANISH SOAP-ROOT** (*G. Hispanica*), called *Jabonera* in Spain, have been employed for washing from time immemorial, and the roots not having a dark rind can be used for washing white articles, and are to some extent an article of commerce, being used for silken and other stuffs, the colors of which will not bear the application of soap. The roots of *lychnis dioica*, one of the most common British plants, possess the same properties in an inferior degree.—The bark of *quillaja saponaria*, a Chilean tree of the natural order *Rosaceæ*, contains much saponin, is generally used for washing in Chili and Peru, and there forms a considerable article of commerce.—Some of the tropical South Sea islands produce a species of vine (*vitis saponaria*), the stem of which, especially the thicker part, cut into pieces, and softened by cooking on hot stones, produces in water a rich lather almost equal to that of soap. See also **SOLANUM**.

SOBBING is merely a modification of the ordinary movements of respiration excited by mental emotions. It is the consequence of a series of short convulsive contractions of the diaphragm, and is usually accompanied by a closure of the glottis, temporarily preventing the entrance of air into the lungs.

SOBIESKI, JOHN. See JOHN III.

SOBRAON', a village on the left bank of the Sutlej, 45 m. s.e. of Lahore, near which, on Feb. 10, 1846, a most obstinate battle was fought between the British army of 15,000 men, under sir Hugh Gough, and a Sikh force numbering 80,000. The Sikhs were strongly intrenched, and vigorously resisted the attacks of their opponents, but the courage and perseverance of the latter ultimately gave them the mastery; the various earthworks were captured in succession, and the Sikhs driven across the Sutlej, with a loss in killed, wounded, and drowned of 13,000. Gough immediately followed up his victory by crossing into the Punjab in pursuit of the fleeing enemy.

SOCAGE, or **SOCAGE** (originally *hlaford-soen*, seeking a lord; whence we have also *soc*, a right of holding a court), a tenure of lands in England, of which the characteristic feature is, that the service is fixed and determinate in quality, thereby differing both from knight-service and from villeinage. It was originally peculiar to the Anglo-Danish districts of England. At the time when the allodial tenure was converted into immediate dependence on the crown, this tenure seems to have arisen out of the necessity for commendation or seeking a lord. In Domesday, socmen are often mentioned as bound "to seek a lord," or free to go with their land where they pleased. The socmen of Stamford are said to be free to seek a lord, being only liable to the king for the toll attached to them as inhabitants of a borough. The obligation of socage in its origin has been compared to the mutual bonds of allegiance of later times so common in the highlands of Scotland, and known as bonds of manrent (see **MANRENT**). Three kinds of socage have been enumerated as existing at a later period—viz., free and common socage, socage in ancient tenure, and socage in base tenure. The second and third kind are equivalent to tenure in ancient demesne and copyhold tenure (see **DEMESNE**, **ANCIENT** and **COPYHOLD**), and the first is what has generally and more properly been denominated socage, where the services were both certain and honorable. Besides fealty, which the socager was bound to do when required, he was obliged to give attendance at the court baron of his lord, if he held one, either for a manor or for a seignior in gross.

By an act passed during the commonwealth, and confirmed after the restoration by 12 Car. II. c. 24, tenure by knight-service was abolished, and all lands except church-lands held in free alms, were directed to be held in free and common socage, which is now (with that exception) the universal tenure of real property in England and Ireland.

Socage tenures are unknown in Scotland, where, unless at a very early period, they never existed.

SOCIALISM, the name given to a class of opinions opposed to the present organization of society, and which seeks to introduce a new distribution of property and labor, in which organized *co-operation* rather than *competition* should be the dominating principle, under the conviction that the happiness of the race, and especially of the classes without capital, would be benefited thereby. Historically considered, socialism, like many of the significant phenomena of our age, is a product of the French revolution. That terrible outburst of popular discontent is most properly regarded as an anarchic attack on the social system that had its roots in the feudalism of the middle ages. The furious hatred of the court and the aristocracy, the passionate love of the "people," of "humanity," of "liberty," though called forth by special circumstances, and never formally worked out into a theory of social life, virtually contained in themselves the germs of all later proposed organizations. In the middle ages, the *right* of freely and fully enjoying life, property, and political independence was limited to a favored few; while the great masses were condemned to dumb servitude, and a perpetual minority. Even the industrial population did not recognize the socialistic idea. The members of the different guilds or fraternities claimed exclusive right to exercise certain branches of industry, and probably the great majority of the inhabitants of a town remained in a disregarded and dependent state. Amid such social conditions, resting, as they did, on a belief in the necessity of different distinct ranks, the free action of individual life, and even the vital progress of the whole community, became well-nigh impossible. We have not space here to trace the course of the various minor reforms that weakened the authority of the mediæval theory of life; but we must not omit to notice the speculations of the political philosophers of the 18th c. in France, England, and Germany, as operating powerfully in favor of a new social system, in which the idea of humanity (assuming, at the French revolution, as we have observed, the concrete form of the "people") stands out prominently. Nevertheless, the first shape that the modern spirit of industry took was not socialistic, in the strict and proper sense of the term; it was rather individualistic, and found, as it still finds—for it is yet the prevailing theory—its natural expression in such proverbs as, "A fair field, and no favor," "Every one for himself, and God for us all." But still, even this lawless individualism is to be regarded as a protest against the false *class-legislation* of preceding times, and as an assertion of the absolute right of *each member of society* to a share in the general welfare. That it has not universally commended itself to civilized mankind as a perfect system, is demonstrated by the appearance and temporary popularity of such schemes of society as those of Owen (q.v.), Fou-

rier (q.v.), St. Simon (q.v.), and the enthusiasm excited at intervals in different parts of Europe by the promulgation of extreme communistic opinions. See COMMUNISM. It is objected to socialism, under its various forms, that it makes human happiness too much dependent on material gratifications; that it robs man of that energy that springs from ambition; that it unphilosophically ignores an individualism and inequality to which nature herself has given her inviolable sanction; and that, by the abolition of social rewards and punishments, it neither holds out any hope to the industrious, nor excites any apprehension among the indolent. On the other hand, we must admit that the vigorous assertion of socialistic principles has led men to a more liberal and generous view of humanity as a whole. Moreover, it has forcibly called public attention to numerous evils that have sprung up along with the modern development of industry, for which no remedy—not even a name—had been provided; to the vital interdependence of all classes; and to the inadequacy of the individual or “selfish” system, as it has been called, to redress the wrongs or cure the evils that inevitably spring from its own unchecked operation. The recent spread of socialistic opinions in Germany led to the enactment of the so-called Socialist Laws in 1878, placing the cities of Berlin and Leipsic in a state of siege, and vesting in the police very arbitrary powers of repression. How little these laws availed was seen by the remarkable growth in the political power of the German socialists, who in 1890 polled 1,427,323 votes as against 763,128 in 1889. In October, 1890, the Socialist Laws expired by limitation and were not re-enacted. See COMMUNISM: INTERNATIONAL WORKINGMEN’S ASSOC.

SOCIAL SCIENCE, a name that has of late years been given to the study of all that relates to the social improvement of the community. A society called “the national association for the promotion of social science” was first organized at a meeting which was held under lord Brougham’s auspices in July, 1857, to consider the best means of uniting together all those interested in social improvement. The annual meetings have been held each year at a different place. The association as now constituted comprises five sections—1. Jurisprudence and amendment of the law (sub-section, repression of crime); 2. Education; 3. Health; 4. Economy and Trade; 5. Art. The association aims at promoting improvement in all matters falling within these departments, by means of bringing together, for free discussion, societies and individuals interested in social problems.

SOCIOLOGY is the somewhat barbarous name that has of late been used to denote the study of the origin, organization, and development of human society.

SOCIAL WARS—wars with *socii* or allies. The most important social war was between Rome and the Italian peoples, such as the Samnites, Peligni, Marsi, etc., who desired to be admitted to the rights of citizenship. M. Livius Drusus, who had been the advocate of the Italian nationalities, was assassinated B.C. 91. The Italian allies of Rome at once revolted, and the three years’ war that followed—during which over 300,000 men are said to have lost their lives—though the Romans, under Marius and Sulla, inflicted terrible losses upon the allies, was substantially a victory for the latter, who eventually were granted the rights demanded. Athens had two social wars, the first with the allied cities of Cos, Chios, and Byzantium, whose independence was secured B.C. 357–55; the second between Athens and the Ætolian and Achæan leagues B.C. 220–17.

SOCIETIES are associations of individuals for the promotion or accomplishment of some particular object. Such objects are numerous, including the promotion and investigation of almost every well-recognized branch of science, art, and literature; the diffusion of knowledge, religion, and morality; intercourse between those of the same profession or trade; the removal of legal grievances; mutual aid in case of distress; and an abundance of other aims, which are either beneficial to the general public or to the members of the society alone. In Great Britain any number of persons may agree to constitute themselves a society if the object of their union is legal. Those whose objects are scientific or literary are occasionally called *academies* (q.v.), and under this or their own special names will be found notices of the chief societies at present existing. “Secret” societies for the accomplishment of some object which involves a subversion of existing political arrangements, spring up from time to time in France, Ireland, Italy, etc.

SOCIETY FOR PROMOTING CHRISTIAN KNOWLEDGE. A society formed in 1698 in the English church, having for its object Christian education in England and Wales, and the spread of the Bible in the colonies. The originator of it was a clergyman, Dr. Thomas Bray. In 1709 this society aided the Danish mission at Tranquebar. The Tanjore mission in 1726, and that at Trichinopoly in 1762, where Schwartz labored, were sustained by it. After the organization of other societies for the express purpose of propagating the gospel in foreign lands this society confined itself to the circulation of Bibles, tracts, prayer-books, etc.

SOCIETY ISLANDS, a small archipelago in the South Pacific ocean, in lat 16° to 18° s., long. 148° to 155° w., is formed of a number of islands, which are actually or practically under French rule. Exclusive of islets, the group is formed of 13 islands—Tahiti or Otaheite, Maitia, Eimeo, Maiaoiti, Tetuaroa, Otahua, Moorea, Tuba, Lord Howe’s Island, Scilly Island, Huahine, Raiatea, and Borabora. Area, 636 sq. m.; pop. about 16,000. The population of Tahiti is 10,113. The chief agricultural interest in Tahiti is

an estate in the hands of an English company. All the islands closely resemble each other in appearance. They are mountainous in the interior, with tracts of low-lying and extraordinarily fertile land occupying the shores all round from the base of the mountains to the sea. They are surrounded by coral reefs, are abundantly watered by streams, and enjoy a temperate and agreeable climate. Almost every tropical vegetable and fruit known is grown here, but agriculture is in a backward state. The animals are those usually found in the South Sea Islands. The inhabitants belong to the Malay race, are affable, ingenious, and hospitable, but volatile and sensual. The practice of tattooing has almost wholly disappeared, and the native costume now closely resembles that of civilized nations. There are now no native manufactures, these having been entirely superseded by imported goods. Cocoa-nut oil, oranges, lime-juice, kauri shells, and pearl shells are the principal articles exported; and cocoa-nuts are the general article of barter throughout the islands for calicoes, cotton cloth, knives, cordage, groceries, etc., which are imported chiefly from Tahiti. The exports from the islands amounted, 1895, to £97,361, and the imports to £97,361.

Tahiti is said to have been visited as early as 1606. Capt. Cook reached it in 1769, and discovered many of the other islands of the archipelago, to which he gave the name of Society Islands in honor of the Royal society of London. In 1797 the first mission-ship fitted out by the newly formed London missionary society arrived at Tahiti. After 19 years of apparently fruitless labor the influence of the missionaries began to be felt, and soon afterward became so powerful as to be almost paramount. A quarrel between the Protestant and Roman Catholic missionaries, who thought it better to enter upon ground already occupied by Protestants than to take up new ground for themselves, occasioned the interference of France in favor of the latter, and the island of Tahiti was taken possession of in the name of Louis Philippe by a strong French force in 1844. All the possessions of the native ruler—who, however, still enjoys nominal authority—were afterward placed under the protection of France; and by a treaty concluded in 1880, Tahiti and its dependencies (particularly Moorea, Tetuaroa, and Raiatea) became French possessions. Many of the Protestant missionaries left the island in consequence of the interference of the French authorities with their labors. Some, however, remained, and the congregations continued to meet. An application to the British government procured a concession on the part of the French government of some of the rights of religious liberty, which had been taken away by the local authorities. See illus., SANDWICH ISLANDS, ETC.

SOCINUS, the name of two celebrated heresiarchs, uncle and nephew, who have given name to a sect of Christians, the Socinians, better known, however, as Unitarians (q.v.). —**LÆLIUS SOCINUS**, the elder of the two, was b. at Siena, in Tuscany, in 1525, and belonged to a family that had long been distinguished for its cultivation of literature and science. His father, Marianus Socinus, was an able lawyer, and designed his son for the same profession. But Lælius soon displayed a strong preference for theological inquiry, and in order to better prosecute his biblical studies he made himself familiar with Greek, Hebrew, and Arabic. The only result of his legal training that one can discern is an obstinate aversion to believe anything "unreasonable." The principles of the reformation had slowly found their way into Italy, and in 1546 a secret society was formed at Vicenza for the discussion of religious questions. It was composed of 40 persons, distinguished by their rank, their occupations, and their titles. Socinus was admitted a member. The conclusions at which they arrived were unfavorable to the dogma of the Trinity, which they held to have been borrowed by the early church from the speculations of Greek philosophers. The purpose of their meetings together having been discovered, the society broke up. Some of the members were arrested and put to death, others sought safety in flight. Among the latter was Socinus, who traveled in France, England, Holland, Germany, and Poland, making the acquaintance, and acquiring the esteem, of many transalpine scholars, and finally settled in Zürich, where he died in 1562, when only 37 years of age. Lælius Socinus, unlike most heretics, was a prudent and reticent man. His speech at least never betrayed him; but in his correspondence with his Italian relatives and friends he showed himself an ardent and eloquent disputant, and made not a few proselytes. Once, in a moment of mistaken confidence, he disclosed himself to Calvin, who grimly warned him to get rid of his "itch of inquiry," lest he should "draw on himself great torments." In the same year occurred the murder of Servetus.—See Ilgen's *Vita Lælii Socini* (Leip. 1814), and *Symbolæ ad Vitam et Doctrinam Lælii Socini* (Leip. 1826).

SOCINUS, FAUSTUS, nephew of the preceding, was the son of Alessandro Socinus, and was also born at Siena, Dec. 5, 1539. By the mother's side he was very highly connected, but having lost his parents while still young, his education was carelessly conducted; and he himself, at a later period, lamented the imperfection of his scholastic culture. His want of learning, however, only induced him to speculate the more freely, and thus it happened, partly from native bias, and partly from his uncle's epistolary arguments, that Faustus was a heretic and anti-Trinitarian before he was out of his teens. In 1559, when only 20 years of age, he found it advisable to seek an asylum in France, and was living at Lyon when he got news of his uncle's death. He immediately proceeded to Zürich, and possessed himself of his relative's MSS., after which he returned to Italy. He entered the service of the grand duke of Tuscany, and during twelve years

seemed to forget, amid the cares of office and the dissipations of a court, the thorny questions of theology. But at the expiry of that period, he was seized with a stronger desire than ever to investigate the truths of religion, and in spite of all remonstrances, proceeded to Germany—the center of theological activity. In 1574 he retired to Basel, to prosecute his studies more closely; but a disputation which he had with a certain Fr. Pucci (1578), obliged him to leave Switzerland. At the request of George Blandrata, he visited Transylvania, where anti-Trinitarians were numerous, especially among the nobles, and eagerly sought (not without success) to make converts to his opinions. In 1579 he went to Poland. Anti-Trinitarianism was even stronger there than in Transylvania, and Socinus soon obtained a great influence. He preached, and disputed, and wrote with a zeal that Socinianism has seldom displayed since. His position in relation to the reformers was, that Luther and Calvin had rendered great services to the cause of religion, but that they had not gone far enough, that the only solid basis on which Protestantism could rest was human "reason," that everything that contradicted it should be rejected as false and incredible, and that dogmas that were absurd should not be allowed to shelter themselves from criticism because their defenders chose to call them "mysteries." The Protestants were alarmed, and the ablest among them undertook publicly to confute Socinus. A disputation was held in the college of Posna, which ended in Socinus reducing all his opponents to silence; but they retaliated (after the unscrupulous fashion of the times) by trumping up against their vanquisher a charge of sedition, which, although ridiculously groundless, made it necessary for Socinus to withdraw from Cracow. While living in retirement on the estate of a Polish noble, Christopher Morszyn, he married the daughter of his protector. She seems to have been a tender and affectionate wife; and when Socinus lost her in 1587, he almost broke his heart through grief. About this period his property in Italy was confiscated; but he had powerful and wealthy friends in Poland, who proved generous to him in his needs. In 1588 he took part in the synod of Brest (on the borders of Lithuania), and combated all the principal dogmas of the church—the divinity of Christ, propitiatory sacrifice, original sin, human depravity, the servitude of the will, and justification by faith. In 1593, on the publication of his *De Jesu Christo Servatore*, his enemies stirred up the populace of Cracow against him; and Socinus was pulled from a sick-bed, and nearly murdered. Soon after, he left the city, and found a refuge with one of his friends in the village of Luclavie, where he died, Mar. 3, 1604. Socinus's works are no longer read; but his opinions have never wanted advocates in any Protestant country. He and his uncle may be regarded as precursors of that spirit of rationalism which has rooted itself so deeply in the thought of the modern world. See Przypcow's *Life of Socinus*, prefixed to a collection of his works in the *Bib. Frat. Polonorum* (Amst. 1656); Bayle's article in the *Dictionnaire*; and Toulmin's *Memoirs of the Life, Character, etc. of F. S.* (Lond. 1777).

SOCIOLOGY. See SOCIAL SCIENCE.

SOCLE, a plain plinth, forming a pedestal for the support of a statue, column, etc.

SOCORRO, a co. in New Mexico, having the state line of Arizona for its w. boundary; 15,476 sq. m.; pop. '90, 9595, chiefly of American birth. It is drained by the Rio Grande del Norte, the San Francisco, and the head-waters of the Gila. The surface is mountainous. A large proportion is unproductive, but the river banks and localities improved by irrigation produce wheat and corn. Much attention is paid to vine-culture and sheep-raising. Its mineral products are gold and iron. Co. seat, Socorro.

SO'COTRA, an island near the entrance to the gulf of Aden, 80 m. long and 30 broad. Area, about 1382 sq. miles. Pop. 10,000, of various races. The surface consists for the most part of a table-land of from 700 to 800 ft. high, but it has mountains rising to a height of 4000 ft. All the streams of the island with the exception of a few rivulets, are dry at a certain season; but rain-water is collected in reservoirs, and in most parts water can be obtained by digging a few feet below the surface. Owing to the somewhat unfertile character of the soil, most of the districts are more adapted for pasture than for agriculture; but grain, fruits, and vegetables are grown in the eastern districts. The aloe plant and the dragon's-blood tree are the chief commercial products. Socotra belongs to the sultan of Keshin, who in 1876 concluded a treaty by which in respect of Socotra, he became a feudatory of Great Britain.

SOCRATES, the celebrated Greek philosopher, was b. at Athens in the year 469 B. C. His father, Sophroniskos, was a sculptor; and he followed the same profession in the early part of his life. His mother, Phænarete, was a midwife, to which avocation he was wont to compare his own peculiar method of conversational teaching. His family was respectable in descent, but humble in point of means. His physical constitution was robust to an extraordinary degree, enabling him to endure the hardest military service, and to live his own chosen life of superiority to all wants above the barest necessities of life. While his ordinary diet was simple and abstemious, he could, on religious festivals or social occasions, drink more wine than any one else without being intoxicated. He had the usual education of an Athenian citizen, which included not only a knowledge of the mother-tongue, and readings in the Greek poets, but also the elements of arithmetic, geometry and astronomy, as then known. As a young man, he frequented the society of the physical philosopher, Archelaus (a disciple of Anaxagoras);

but the philosophers that did most to determine his own special turn of mind must have been Parmenides and "the double-tongued and all-objecting Zeno."

Excepting in connection with his philosophical career, few circumstances of his life are known. He served as a hoplite, or heavy-armed foot soldier, at the siege of Potidæa, at the battle of Delium, and at Amphipolis, and his bravery and endurance were greatly extolled by his friends. On two memorable occasions, he stood forward in political life. After the battle of Arginusæ, in 406, the ten generals in command were publicly arraigned for neglecting to obtain the bodies of the killed to receive the rites of interment. The clamor for their condemnation was so great, that the court wished to proceed in violation of the legal forms; but Socrates, as the presiding judge, firmly refused to put the question. The other occasion was during the tyranny of the Thirty, who took up the policy of compelling a number of influential citizens to take a part in their illegal murders and confiscations; but Socrates withstood them at the peril of his own life.

Somewhere about the middle period of his life, he relinquished his profession as a statuary, and gave himself up to the career that made him famous. Deservedly styled a philosopher, he neither secluded himself for study, nor opened a school for the regular instruction of pupils. He disclaimed the appellation of teacher; his practice was to talk or converse, "to prattle without end," as his enemies said. "Early in the morning, he frequented the public walks, the gymnasia for bodily training, and the schools where youths were receiving instruction; he was to be seen in the market-place at the hour when it was most crowded, among the booths and tables where goods were exposed for sale. His whole day was usually spent in this public manner. He talked with any one, young or old, rich or poor, that sought to address him, and in the hearing of all who chose to stand by. He visited all persons of interest in the city, male or female; his friendship with Aspasia is well known; and one of the most interesting chapters of Xenophon's *Memorabilia* recounts his visit to and dialogue with Theodotê—a beautiful *hetæra*, or female companion. Nothing could be more public, perpetual, and indiscriminate as to persons than his conversation; and as it was engaging, curious, and instructive to hear, certain persons made it their habit to attend him in public as companions and listeners. These men, a fluctuating body, were commonly known as his disciples or scholars, though neither he nor his personal friends ever employed the terms *teacher*, and *disciple* to describe the relation between them."—Grote's *Greece*, chap. lxviii.

Another peculiarity of Socrates was his persuasion of a special religious mission. He had been accustomed all his life to hear what he considered a divine voice, or preternatural sign, which came to him solely as a prohibition or warning, and never as an instigation to act. In deference to it, he had kept back from entering public life, and it caused him to refrain from premeditating the defense that he made on his trial. Nor was this all; relying, like his countrymen, on divine intimations by dreams and oracles, he believed that his mission had been signified to him by these. One oracular intimation in particular he described in his defense as the turning-point of his life. An admirer and friend of his, Chærephon, about the time when he began to have some repute as a wise man, consulted the oracle at Delphi as to whether any man was wiser than Socrates. The priestess replied: "None." The answer, he said, perplexed him very much; for he was conscious to himself that he possessed no wisdom on any subject, great or small. At length, he resolved to put the matter to the test by taking measure of the wisdom of other persons as compared with his own. Selecting a leading politician, accounted wise by himself and by others, he put a series of questions to him, and found his supposed wisdom was no wisdom at all. He next tried to demonstrate to the politician himself how much he was deficient; but found him impracticable on this head, refusing to be convinced. He then saw a meaning in the oracle, to the effect that his superiority to others lay not in his wisdom, but in his being fully conscious of his ignorance. He tried the same experiment on other politicians and rhetors, then on poets, and lastly on artists and artisans, and with the same result. Thereupon, he considered it as a duty imposed upon him by the Delphian god to cross-question men of all degrees as to their knowledge, to make them conscious of their ignorance, and thereby put them in the way of becoming wise. We shall see presently wherein this low view of the human intelligence differed from the contemptuous tone of a mere satirist.

The intellectual characteristics of Socrates, through which he influenced the whole subsequent course of human thought, may be stated under three heads: 1. Subject, 2. Method, and 3. Doctrine.

1. As to subject.—Here he effected a signal revolution, metaphorically expressed by the saying of Cicero, that "Socrates brought down philosophy from the heavens to the earth." The previous philosophies consisted of vast and vague speculations on nature as a whole, blending together cosmogony, astronomy, geometry, physics, metaphysics, etc. Socrates had studied these systems, and they left on his mind a feeling of emptiness and unsuitability for any human purpose. It seemed to him that men's endeavors after knowledge would be better directed to the human relationships, as involving men's practical concerns. He could not go to any public assemblage without hearing questions agitated respecting the just and unjust, the honorable and base, the expedient and hurtful; moreover, he found that the opposing disputants were, without knowing it, very confused in their ideas as to the meanings of those large words in which the weightiest interests centered. Accordingly, he was the first to proclaim that "the proper

study of mankind is man;" human nature, human duties, and human happiness made up a field of really urgent and profitable inquiry. In astronomy he saw a certain utility for navigation, and for the reckoning of time, to which extent he would have it known by pilots and watchmen; geometry was useful in its literal sense of land-measuring; arithmetic he allowed in like manner so far as practically useful; but general physics, or the speculations of philosophers, from Thales downward, as to the origin of all things, out of water, fire, air, etc., he wholly repudiated. "Do these inquirers," he asked, think that they already know *human* affairs well enough, that they thus begin to meddle with divine? Do they think that they shall be able to excite or calm the winds at pleasure, or have they no other view than to gratify an idle curiosity?" He considered it not only unprofitable but impious to attempt to comprehend that department. The gods, he thought, managed all those things after their own fashion, and refused to submit them to invariable laws of sequence, such as men might discover by dint of study; the only means of knowledge permitted was religious sacrifice and prayer, and the consultation of the oracles. While this was the appointed way in reference to divine things, it was equally appointed that human things should be learned by diligence in study and investigation.

2. In regard to method, Socrates was the author of still greater innovations. It was to little purpose that men applied themselves to human affairs, if they conceived them loosely, and with no regard to evidence. Socrates introduced at least one element of logical precision into the handling of questions, by insisting on accuracy in definition and classification. His mode will be seen in the statement of Xenophon. "Socrates continued incessantly discussing *human* affairs, investigating—What is piety? What is impiety? What is the honorable and the base? What is the just and the unjust? Men that knew these matters, he accounted good and honorable; men that were ignorant of them, he assimilated to slaves."

His investigation thus took the form of ascertaining the exact meaning—that is, the definition—of the leading terms in ethics and in politics, the settling of what J. S. Mill calls the *connotation* of a general word, which determines how to apply it rightly to each individual case. The very idea of defining a general term, now so obvious, never seems to have suggested itself to any one previous to Socrates. And his manner of seeking out those definitions is also characteristic, and links itself to his conversational method, and his convicting men in general of ignorance in things that they thought they knew. Professing himself to be able to furnish no exact definition (this professed ignorance was called the Socratic irony) of justice, temperance, courage, etc., and finding every one else quite confident in their ability to supply the want, he asked some one to state his definition; and on its being given, he put a few further interrogations (as he said) by way of making sure that he understood the meaning, but with the speedy effect of driving the respondent into a humiliating self-contradiction. His method is most fully exemplified in certain of the Platonic dialogues, as the first *Alcibiades*, *Lachés*, *Charmides*, *Euthyphron*, etc. According to Xenophon, he could pass from his severe cross-examining method, with its humiliating shock of convicted ignorance, and address to his hearers plain and homely precepts, inculcating self-control, temperance, piety, duty to parents, brotherly love, fidelity in friendship, diligence, etc.—such direct admonitory influence being common to him with the so-called sophists. He probably went beyond the ordinary teaching of the sophists in exhorting men "to limit their external wants, to be sparing in indulgence, and to cultivate, even in preference to honors and advancement, the pleasures arising from a performance of duty, as well as from self-examination and the consciousness of internal improvement." This strain of exhortation, his manner of life in harmony therewith, and the virtual self-immolation of his death, may be considered as the conjoint root of the cynic and the stoic philosophers.

As regards doctrine, Socrates was distinguished chiefly by his theory of virtue. Virtue, he said, consisted in knowledge. To do right, was the only road to happiness; and as every man sought to be happy, vice could arise only from ignorance or mistake as to the means; hence the proper corrective was an enlarged teaching of the consequences of actions.

We cannot, on any fair interpretation of knowledge, regard this as other than a one-sided view. It takes note of one condition of virtue, since there can be no right conduct without understanding the tendency of actions, or, at all events, the meaning of rules; but it omits, what is also essential, the state of the emotions or dispositions, which may be directed either to exclusively self-regarding ends, or to ends involving also the good of others. There is an obvious connection between the doctrine and the Socratic analogy of virtue to the professions. The virtue of an artisan is almost exclusively contained in his skill or knowledge; his dispositions can usually, though not always, be depended on, through the pressure of his immediate self-interest. But the practice of Socrates was larger than his theory; for, as already remarked, his exhortations were addressed to men's feelings or sentiments as well as to their intellect. His political doctrines were biased by the same analogy of special professions. The legitimate king or governor was he alone that knew how to govern well.

In the year 399 B. C., an indictment was laid against Socrates, in the following terms: "Socrates is guilty of crime: first, for not worshipping the gods whom the city worships, and for introducing new divinities of his own; next, for corrupting the youth. The

penalty due is death." The trial took place before a dikastery, or law-court, composed of citizen-judges, like our juries, but far more numerous; the number present seems to have been 557. His defense is preserved by Plato, under the title *Apology of Socrates*. The tone of it, so admirable to us, was such as to make acquittal all but impossible, from the number of enemies created by his cross-questioning annoyance of all classes of men, and from various other causes. He dwelt on his mission to convict men of ignorance for their ultimate benefit; pronounced himself a public blessing to the Athenians; declared that, if his life was preserved, he would continue in the same course; and regarded the prospect of death with utter indifference. By a majority of either five or six, the charges were declared to be proven. A vote had then to be taken on the sentence. By the Athenian practice, the accuser named a penalty, and the accused was asked to do the same; the judges were restricted to one or other of these. The accuser named death. Socrates, maintaining the same high tone, declared at first that he deserved the highest public reward; but, on the instigation of his friends, he ended by proposing a trifling fine. The court, by a majority, decided for the capital sentence. There was an accidental interval of 30 days before the execution, during which Socrates in prison conversed with his friends as usual; on the last day occurred his conversation on the immortality of the soul, referred to in the Platonic dialogue called *Phædon*. He then drank the hemlock, and passed away with the dignity and calmness becoming his past life.

"There can be no doubt," says Mr. Grote, "that the individual influence of Socrates permanently enlarged the horizon, improved the method, and multiplied the ascendant minds of the Grecian speculative world, in a manner never since paralleled. Subsequent philosophers may have had a more elaborate doctrine, and a larger number of disciples who imbibed their ideas; but none of them applied the same stimulating method with the same efficacy; none of them struck out of other minds that fire which sets light to original thought; none of them either produced in others the pains of intellectual pregnancy, or extracted from others the fresh and unborrowed offspring of a really parturient mind."—See Grote's *Greece*; Zeller's *Philos. der Griechen*.

SODA. See SODIUM.

SODA, MANUFACTURE OF. Soda, or, more correctly, carbonate of soda, occupies the chief place among our leading chemical manufactures, alike from its own importance, and also on account of its influence on other great chemical industries, such as glass-making, soap-making, bleaching, etc.

A native carbonate of soda, or rather a sesqui-carbonate, called natron (q.v.), is found in Egypt and some other parts of the world. In Hungary, several manufactories exist for the purification of a native soda found there. Formerly, most of the soda in use was extracted from certain plants; and two kinds were known in commerce under the names of barilla (q.v.) and kelp (q.v.).

But the quantity of soda got from all other sources is now insignificant in comparison with that manufactured from common salt (chloride of sodium—see SODIUM). The process was invented by a Frenchman named Leblanc, and was first made known to the world by a commission of the French republic in 1794, although dating some years earlier. It is unquestionably the most valuable discovery in the entire range of chemical manufactures; and it has been practiced for nearly ninety years without any important alteration. It is sad to think that the author of this invention reaped no benefit from it himself, but spent the last of his days in an hospital, "a wreck in fortune, health, and hope." Owing partly to the war between France and England, and partly also to the existence of a duty of £30 per ton on common salt, which continued for eight years after the close of the war, Leblanc's process was not adopted in Great Britain except on a very limited scale till 1823. After the repeal of the tax in that year, Mr. James Muspratt erected his celebrated works at Liverpool, adopted the process in its entirety, and succeeded, after overcoming many difficulties, in establishing in Great Britain a chemical manufacture which has since become the most important in the world, and for which nearly 600,000 tons of common salt are now annually required.

The object of the soda-process is to separate the sodium of the salt, and unite it with oxygen to form caustic soda, or, what is more generally done, to unite the sodium with both oxygen and carbonic acid to form carbonate of soda. The several stages of the process are as follows:

First Operation—The Production of Sulphate of Soda.—The decomposition of the common salt is effected by treating it with sulphuric acid, which transforms it into sulphate of soda and hydrochloric acid. This operation was long conducted in a common reverberatory furnace (q.v.), and the hydrochloric acid was suffered to escape into the air. Not only was the acid thus lost, but it destroyed all vegetation in the neighborhood of soda-works, and involved their owners in serious law-suits for damages. The great chimneys of the St. Rollox works, Glasgow, and Mr. Muspratt's, Liverpool, which are nearly 500 ft. high, were erected with a view of curing this evil, but they were found to be ineffectual. The most improved furnaces now in use for the purpose are built in pairs, and in the front part of each there is a shallow cast-iron pan, nine ft. in diameter, with a sheet-iron cover, and so built that the fire may act on the bottoms and sides. Behind this, an oblong brick

chamber, 30 ft. by 9 ft., is situated, with separate fire-places, and called the salt-cake furnace. Acid flues are led from each compartment of the double furnace into one main flue, which has its outlet into a condensing tower, to be presently described. Separate flues are also provided for the conveyance of smoke to a main chimney. The furnace is worked in the following way: when it is properly heated, salt to the amount of 10 cwt. is thrown in by an opening, and about 80 gallons of strong sulphuric acid are heated and run in. The mixture, which is well stirred with an iron rake, gradually thickens, and in about an hour the pasty mass, not yet all decomposed, is pushed through the opening into the salt-cake chamber. Here it is spread out on the sole, and maintained at a red heat for another hour, when the whole of the hydrochloric acid is expelled, and the conversion into sulphate of soda complete. A pair of furnaces, about one-half larger than those above described, will produce about 19 tons of sulphate of soda in a day, for which 16 tons of common salt are required. At the St. Rollox chemical works, Glasgow, about 500 tons of common salt are decomposed weekly.

A very important part of this operation is the condensation of the hydrochloric acid gas, which is disengaged in large volumes during the decomposition of the salt. As already stated, it was formerly allowed to escape into the atmosphere. The acid flues convey it to the condensing towers, which are generally filled with pieces of burnt coke, through which a supply of water is kept running. The gas enters at the bottom of the first tower, passes upward, and descends the second, and is gradually absorbed by the water, forming strong liquid acid, which is run out by openings at the bottom of the condenser. So perfect is the system of condensation now in use at some works, that of the acid produced by 100 tons of pure chloride of sodium which should yield 62 tons, as much as 58½ tons have actually been collected; and it has been instanced, as a curious illustration of this in another way, that Mr. Muspratt's great works, which were at one time forced out of Liverpool as a nuisance, have been established there again without causing any protest. Nevertheless such works being still considered obnoxious to their neighbors, an "alkali act" was passed by parliament in July, 1863, "For the more effectual condensation of muriatic (hydrochloric) acid gas in alkali works." It compels every manufacturer of alkali to secure the condensation of not less than 95 per cent. of the muriatic gas evolved in his works, under a penalty not exceeding £50. This act was amended in 1874 by which copper and sulphuric acid works were placed under similar restrictions. The hydrochloric acid obtained in this process is mostly used in the manufacture of bleaching-powder.

Second Operation—The Conversion of the Sulphate of Soda into Black-ash, called also Ball-soda.—This is effected by heating a mixture of sulphate of soda, carbonate of lime, and coal, in a reverberatory furnace. The proportions now used are the same as those first recommended by Leblanc—viz., sulphate of soda, 100 parts; carbonate of lime, 100 parts; carbon (charcoal), 55 parts. But as coal is employed in England instead of charcoal, the quantity used is generally 75 to 100 of each of the other two ingredients. The "balling furnace" used in this operation has two beds, the one being raised a few inches above the other. The waste heat from the fire-place is usually employed in boiling down the soda-lye. The charge is thrown into the bed of the balling furnace away from the fire-place after it has been raised to a bright red heat, and remains till it becomes sufficiently heated throughout the whole mass. It is then transferred to the *fluxing bed*, which is next the fire, and exposed to a higher heat, when it shortly begins to soften and flux into a mass like dough. In about half an hour the charge is withdrawn in a red-hot state by the working door, and received into iron barrows, where it solidifies into blocks of crude soda termed ball-soda, or black-ash. A new kind of balling furnace, first introduced at the Jarrow Chemical works, South Shields, is now becoming extensively used. It differs from the one described in having that portion of it for receiving the mixture of sulphate of soda, coal, and lime in the form of a brick-lined iron cylinder, large enough in some instances to decompose 50 tons of the sulphate in 24 hours. This cylinder lies in a horizontal position, and is made to revolve slowly by engine-power. The materials are introduced by means of a hopper; the fire-place, which does not rotate, is placed at one end of the cylinder; and the arrangement for evaporating the lye is somewhat similar to that employed in the furnace described. This rotary furnace admits of the work being much better done than by the older reverberatory furnace, as it not only saves labor, but prevents loss of soda by volatilization.

In this process there is first a reduction of sulphate of soda to sulphide of sodium with evolution of carbonic acid; then a conversion of the sulphide of sodium and carbonate of lime into carbonate of soda and sulphide of calcium; and finally the excess of carbonate of lime is reduced by the carbon to caustic lime and carbonic oxide.

Third Operation—The Preparation of Carbonate of Soda from the Black-ash, by Lixiviation and Evaporation.—For some purposes the crude soda, or black-ash, is used without further purification; for example, in the making of soap. Its lixiviation is effected by the use of a series of iron tanks, or vats, into which it is placed with water. Several tanks, each of the capacity of 600 gallons, rise above one another in successive stages, so that the liquor of the highest can be run into the next lower, and so on. The black-ash is introduced fresh into the lowest vat; it then passes from vat to vat, and is taken away exhausted at the highest one. The water, on the contrary, comes in fresh at the

top, and in passing downward encounters less exhausted ash in each succeeding vat, and finally passes away from the lowest a fully saturated solution. In most soda-works, the vats are now arranged differently, although the ash may be said to be exhausted in the same way. In the new arrangement, the vats are placed horizontally, and advantage is taken of the fact that solutions in becoming richer become also heavier, so that, although the tanks are all on a level, the water runs through them with what is virtually a downward flow. We have not space to describe minutely this very elegant and economical plan; it will be enough to say that it completely obviates the necessity of lifting the ash from vat to vat, because any two contiguous ones can be made at pleasure the highest and lowest points, and, therefore, those of ingress and egress for the lixiviating fluid. "Each vat, in due rotation, is emptied and refilled; and thus each in turn successively occupies the highest, lowest, and all intermediate points of the declivity."

The next stage is the evaporation of the soda-lye, which is conducted in a variety of ways. A common method consists in using the waste heat of the balling furnace, the flame from which passes over the surface of the liquor. With proper manipulation the soda falls to the bottom, and is raked out at intervals through a side-door, and drained upon a sloping surface.

The soda-salts (chiefly carbonate of soda), thus obtained by evaporation of the lye, contain caustic soda, which requires to be carbonated, and a little sulphide of sodium, which it is necessary to get rid of. They are accordingly transferred to a reverberatory furnace, and calcined, at a moderate heat, along with sawdust, or sometimes with small coal, the mixture being stirred with iron paddles. By this treatment, the caustic soda is converted into carbonate of soda, the sulphur is mostly expelled, and we now obtain the *soda-ash*, or alkali of commerce, which generally contains about 50 per cent. of real soda, Na_2O ; the other ingredients, besides the carbonic acid with which it is combined, being chiefly water, sulphur, and common salt. Sometimes it is further purified, and it is then known as *white alkali*.

Soda crystals, or what is commonly called "washing-soda," are obtained by dissolving the soda-ash in hot water, then filtering the solution and boiling it till the specific gravity reaches 1.3, when it is transferred to the crystallizing coolers. Bars of wood or iron are laid across these vessels to sustain the mass of crystals which form, and in ten days at most the crystallization is complete. Crystals of soda are purer than soda-ash, but they are of much less value, weight for weight, because of the large quantity of water which enters into their constitution, amounting to $62\frac{1}{2}$ per cent.

The manufacture of caustic-soda is now an important branch of the alkali trade. For soap-making, bleaching, and several other purposes, carbonate of soda requires to be rendered caustic by quicklime. Manufacturers have, accordingly, taken to the plan of treating the black-ash liquor with hydrate of lime, and so obtain caustic-soda at this stage, instead of sending it into the market as a purified carbonate of soda, for purposes where it requires to be decarbonated again. Another plan consists in mixing a small quantity of chloride of lime, or nitrate of soda, with the soda-lye from the black-ash. It is then concentrated into a strong solution, and finally brought to the state of a fused mass in round iron pots heated to redness. Great attention is now given to the recovery of sulphur from the enormous "waste heaps" which accumulate at all large alkali works, since there is fully a ton of this "waste" produced for every ton of common salt used. It consists largely of noxious sulphides of calcium, and is a source both of river and, in warm weather especially, of atmospheric pollution. Mond's process, or some modification of it, is usually adopted. Some chemical changes are first produced in the waste by the action of common air, and the sulphur afterward precipitated by hydrochloric acid.

Various processes have been at different times proposed, and many have been patented, for making carbonate of soda by other methods than that of Leblanc; but only one of these has had any measure of success. We allude to what is called the "ammonia process," patented by Dyer & Hemming in 1838. Several improvements—some of them quite recent—have been made on the original method, and the process is now worked on the large scale at Northwich in Cheshire, and at several places on the continent. It consists in treating a solution of common salt with bicarbonate of ammonia, by which bicarbonate of soda is produced, and the chloride of ammonium remains in solution.

Sulphate of soda is made at Widnes, in Lancashire, by Mr. Hargreaves's process of decomposing bricks of common salt with sulphurous acid and steam. This method, by avoiding the direct use of sulphuric acid, saves the expense of nitrate of soda; and there is also a saving in the wear and tear of apparatus, owing to the lower temperature required. See LOMIS, *Manual of the Alkali Trade*, 1880.

SODA-WATER. See AERATED WATERS; SODIUM.

SÖDERMANLAND, a province of s.e. Sweden, bounded n. by lake Maelar, s.e. by the Baltic; 2631 sq.m.; pop. '95, 161,722. The surface is level. The soil is fertile. Agriculture and fishing are the chief occupations. Capital, Nyköping.

SODIUM (symb. **Na**, equiv. 23, spec. grav. 0.972), is one of the metals of the alkalis—its oxide being soda. Its properties closely resemble those of the allied metal, potassium. It is of a bluish-white color, is somewhat more volatile than potassium, and further differs from that metal in having a higher fusing-point, 203.9° F. (95.6° C.), a greater specific gravity, and in not catching fire when dropped in water (unless the water is heated), although like potassium under similar conditions, it partially decomposes it and liberates hydrogen; and at the same time communicates a strong alkaline reaction to the solution. If, however, a piece of unsized paper is placed on the surface of cold water, and the sodium be placed on the paper, the metal takes fire, and burns with a deep yellow flame. Strictly speaking it is the liberated hydrogen rather than the metal which burns, the yellow tint (which is characteristic of the sodium compounds) being due to a little sodium volatilized by the heat, mixing and burning with the hydrogen. When heated in the air, it burns with its characteristic yellow flame, and is converted into soda. When exposed *in vacuo* to a red heat it assumes the form of vapor, and admits of distillation. Like potassium, it must be kept immersed in naphtha, so as to exclude the oxidizing action of the air. As a reducing agent, it is little inferior to potassium, and as its combining power is lower, and it is obtained much more cheaply, it may usually be advantageously substituted for potassium in reducing operations. Sodium does not occur in the metallic form in nature, but its compounds are very widely distributed. It is found by far the most abundantly in the form of chloride of sodium (or common salt), but it likewise occurs as albite or soda-feldspar, cryolite (the double fluoride of sodium and aluminium, and the principal source from whence aluminium is procured), borax (the baborate of soda), trona (the sesquicarbonate of soda), and Chili saltpeter (nitrate of soda).

The methods of obtaining sodium are similar to those already described for obtaining potassium. The following procedure recommended by Deville is regarded as the best for obtaining it in large quantity. Intimately mix 717 parts of dried carbonate of soda with 175 parts of finely powdered charcoal and 108 parts of finely ground chalk, knead them into a stiff paste with oil, heat them in a covered iron pot till the oil is decomposed, and finally distil them in an iron retort with the precautions which are noticed in describing the preparation of potassium (q.v.). The object of adding the chalk is to prevent the separation of the charcoal from the carbonate of soda when the latter fuses. This mixture ought to yield nearly one-third of its weight of sodium.

With regard to the history of sodium, it is sufficient to observe that Duhamel, in 1736, discovered that potash and soda (now known to be the oxides of potassium and sodium) were distinct bodies. Sir H. Davy first obtained the metal *sodium* in 1807. The symbol of this metal, **Na**, is the abbreviation of *natrimum*, which is derived from *natron*, one of the old names of native carbonate of soda.

Sodium combines with all the elementary gaseous bodies, and two of these combinations—viz., those with oxygen and chlorine, are of extreme importance and value.

With *oxygen*, sodium forms two compounds—viz., an oxide, Na_2O , and a peroxide Na_2O_2 . The latter being of no practical value, may be passed over without notice. The oxide (soda) was formerly known as *fossil* or *mineral alkali*, to distinguish it from potash, which, from the source from which it was procured, was termed *vegetable alkali*. Anhydrous soda, Na_2O , is procured by burning the metal in dry air; it is of a yellowish-white color, powerfully attracts moisture, and retains the water so firmly that it cannot be expelled by heat. Hydrated or caustic soda, NaOH , closely resembles, both in its properties and in the mode of procuring it, the corresponding potash compound. It is, however, not so fusible as the latter, and is gradually converted, by exposure to the air, into carbonate of soda, which in its anhydrous state is also less fusible than the potassium carbonate. Solution of hydrate of soda (or soda lye) is largely employed in the arts. It is prepared by boiling a tolerably strong solution of carbonate of soda with milk of lime until a portion of the filtrate ceases to effervesce on the addition of an acid. The solid hydrate has a specific gravity of 2.13, and the quantity of anhydrous soda in any solution may be pretty closely approximated to by determining the specific gravity of the fluid at a temperature of 59° F. (15° C.). Tables for this purpose have been constructed by Dalton (quoted in Miller's *Inorganic Chemistry*, 2d ed., p. 37), and by Zimmerman (reprinted in the article "Sodium" in Knight's *English Cyclopædia*).

Many of the combinations of the oxide of sodium (soda) with acids—constituting soda salts—are of great importance. Carbonic acid forms three salts with soda—viz., a normal carbonate, a sesqui-carbonate, and a bicarbonate of soda.

The *normal* or *ordinary carbonate of soda*, or *sodium carbonate*, $\text{Na}_2\text{CO}_3 + 10\text{H}_2\text{O}$, popularly known as the *soda* of commerce, is a colorless, inodorous salt, with a nauseous alkaline taste. It crystallizes in large transparent rhomboidal prisms, which contain nearly 63 per cent. of water, but it readily parts with all this water on the application of heat. The crystals also lose the greater part of their water on mere exposure to the air, when they effloresce and fall to powder. Water at 60° F. dissolves half its weight of the crystals, and boiling water considerably more, the solution acting like an alkali on vegetable colors. This salt occurs native in the natron-lakes of Hungary, Armenia, etc., in association with sulphate of soda and chloride of sodium. In other regions it appears in an efflorescent form on the surface of the earth. It is now, however, almost entirely manufactured from sea-salt. See SODA, MANUFACTURE OF.

Sesquicarbonate of soda, $\text{Na}_2\text{CO}_3 + 2\text{NaHCO}_3 + 3\text{H}_2\text{O}$, occurs native in the form of large, hard, non-efflorescent prisms, in Hungary, Egypt, Mexico, etc., under the name of *trona* or *natron*. When strongly heated, it loses one third of its carbonic acid, and becomes converted into the preceding salt. As its formula shows, it is not a true single carbonate, but a mixture of the normal and the acid carbonate.

Bicarbonate of soda, or *acid sodium carbonate*, NaHCO_3 , may be formed by passing a current of carbonic acid through a strong solution of carbonate of soda, till saturation takes place, and allowing the mixture to crystallize; or it may be produced on a large scale by exposing crystals of carbonate of soda to a prolonged current of carbonic acid. The bicarbonate crystallizes in four-sided prisms, which require 10 parts of water at an ordinary temperature for their solution. This salt is used largely in medicine. See AERATED WATERS.

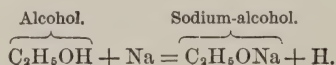
Sulphuric acid forms with soda a normal and an acid sulphate.

The *normal or ordinary sulphate of soda*, $\text{Na}_2\text{SO}_4 + 10\text{H}_2\text{O}$, has been already described under its synonym of *Glauber's salt* (q.v.). The acid salt, or *bisulphate* of soda, NaHSO_4 , is of no special interest.

The *hyposulphite of soda*, $\text{Na}_2\text{S}_2\text{O}_3 + 5\text{H}_2\text{O}$, occurs in large, colorless, striated rhombic prisms, of a cooling and sweet taste. When strongly heated in the air, it burns with a blue flame. It dissolves readily in water, depositing sulphur if the solution be kept in a closed vessel. It may be obtained by digesting powdered sulphur in a solution of sulphite of soda. The sulphur is gradually dissolved, and forms a colorless solution, which, on evaporation, yields crystals of hyposulphite of soda. This salt is largely employed in photography, and is occasionally prescribed medicinally. Sulphurous acid forms two salts with soda—viz., a sulphite and a bisulphite. The *sulphite of soda*, $\text{Na}_2\text{SO}_3 + 7\text{H}_2\text{O}$, is obtained by passing sulphurous acid over carbonate of soda, dissolving the resulting mass in water, and crystallizing; when the salt is obtained in efflorescent oblique prisms, which fuse at 113°F ., and are soluble in 4 parts of cold water, the solution having a slightly alkaline reaction, and a sulphurous taste. This compound is commercially known as *antichlore*, and is largely used in paper-manufactories for the purpose of removing the last trace of chlorine from the bleached rag-pulp. The *bisulphite* is of no importance. *Nitrate of soda*, NaNO_3 , known also as *cubic niter* or *Chili salt-peter*, occurs as a natural product on the surface of the soil of certain South American districts. In most of its properties, excepting its crystalline form, and further in its being deliquescent, it resembles nitrate of potash. It is used to a considerable extent as a manure. The *phosphates of soda*, though comparatively numerous, do not call for notice here. See PHOSPHATES. *Hypochlorite of soda*, NaClO , is at present only known in solution, in which it occurs as a yellowish-green fluid, evolving a smell of chlorine; it has strong bleaching power, and, when boiled, becomes decolorized, and evolves chlorine freely. It is formed by passing a stream of chlorine gas through a solution of carbonate of soda, the resulting solution containing the hypochlorite, together with undecomposed carbonate of soda and chloride of sodium. This solution is useful as a bleaching agent, as an oxidizing agent in analytical chemistry, and as a disinfectant agent. There are two *borates of soda*, of which the only important one, the *biborate*, is already described under its ordinary name of *borax* (q.v.). Various *silicates of soda* have been formed. In reference to the properties of these salts, see the articles FUCHS'S SOLUBLE GLASS; GLASS.

The *haloid salts* of sodium resemble, in their general characters, the corresponding salts of potash. Of these by far the most important is *chloride of sodium* or *common salt*, formerly known as *muriate of soda*, NaCl . It occurs naturally in far greater quantity than any other soluble salt. See ROCK-SALT, SEA, WATER. The following are its leading properties: It crystallizes in colorless, transparent cubes, which are anhydrous, soluble in about 3 parts of cold water, and scarcely more soluble in boiling water. A saturated solution has a specific gravity of 1.205, the specific gravity of the salt being 2.125. It is insoluble in pure alcohol, is inodorous, and has a purely saline taste, unmingled with bitterness, unless chloride of magnesium be mixed with it. At a red heat it fuses, and becomes converted into a transparent brittle mass. The well-known decrepitation which occurs when salt is thrown on the fire, or otherwise strongly heated, results from the sudden expansion of water mechanically entangled among its particles. The uses of this salt have been known from the earliest times. It is an essential constituent of the food both of man and animals. From want of space we must refer our readers to Liebig's *Letters on Chemistry* (Letter xxviii.) on this subject, in which the functions of salt in the food and in the blood are clearly pointed out. It is regarded as a necessity even by the rudest nations. "In several countries of Africa men are sold for salt; among the Gallas and on the coast of Sierra Leone the brother sells his sister the husband his wife, and parents their children, for salt; in the district of Accra (Gold coast), a handful of salt, the most valuable merchandise after gold, will purchase one, or even two slaves."—Note to Liebig's *op. cit.*, p. 413. Chloride of sodium is employed in the process of salting meat in consequence of its powerful antiseptic properties. Meat thus prepared loses, however, a considerable portion of its nutritive juices, which pass into the brine, and is less digestible than in its natural state. Among the purposes for which this salt is mainly employed may be mentioned the manufacture of the various salts of soda, especially the carbonate; the preparation of hydrochloric acid; the glazing of stoneware; the preparation of soap, etc. The other haloid salts—the iodide, bromide, and fluoride of sodium—require no notice.

Sodium has been recently found to enter into various groups of organic bodies. We shall take the sodium-alcohols as an example. When sodium or potassium is gradually added to anhydrous alcohol, the temperature rapidly rises, the metal is dissolved, hydrogen is evolved, and a fusible deliquescent compound is formed, which has received the name of *sodium-alcohol* (or potassium-alcohol), or of *ethylate of soda* (or potash), its composition being such that it may be regarded as alcohol in which one atom of hydrogen is replaced by one of the metal; as shown in the equation:



The action of sodium or potassium on the other alcohols is of an analogous nature.

The tests for the salts of sodium are not very satisfactory, because the metal forms scarcely any insoluble compounds. A salt of sodium is usually concluded to be present when, the absence of all other bases having been proved, a saline residue remains, which, with tetrachloride of platinum, yields yellow striated prisms, $2\text{NaCl} \cdot \text{PtCl}_4$, by spontaneous evaporation. Before the blowpipe the salts of sodium are known by the intense yellow which they communicate to the outer flame, and if a weak alcoholic solution of one of the salts is burned, a similar yellow tint is communicated to the flame. Spectrum analysis is too delicate to be of much practical use. Bunsen estimates the amount of soda that may be thus detected at the 195,000,000th part of a grain; and considering how universally diffused chloride of sodium is, this fractional amount is hardly likely to be absent.

In conclusion, the *medicinal uses* of the sodium compounds require our notice. They will be considered alphabetically. *Acetate of soda* is a mild diuretic, similar in operation to acetate of potash, for which it may be substituted. It may be given in doses varying from a scruple to a couple of drams. *Arseniate of soda*, Na_2HASO_4 , is serviceable in periodic affections, chronic skin-diseases, and the cases in which arsenic is generally employed in medicine. It has all the advantages of arsenite of potash, and seems to cause less irritation of the stomach. It is best given in the form of *Pearson's solution*, which consists of 1 grain of the crystals of this salt dissolved in 10 drams of distilled water. Dose, from 20 minims very gradually increased to 2 drams, 3 times daily. The *liquor soda arseniatis* of the pharmacopoeia is much stronger; its dose being from 3 to 10 minims. Paper impregnated with a solution of arseniate of soda sweetened with sugar is sold as a poison for flies. *Biborate of soda*, or *borax*, is employed principally as a tropical astringent, and is used with advantage in aphthous eruptions of the mouth and throat. *Bicarbonate of soda* is a most popular remedy in cases of dyspepsia, but its use is highly injurious when there are phosphatic deposits in the urine. See PHOSPHATIC DIATHESIS. Neligan strongly recommends the external application of an ointment consisting of 20 or 30 grains of the bicarbonate, with an ounce of cold cream, in cases of papular and vesicular eruption of the scalp. *Carbonate of soda* is not employed as an antacid so frequently as the bicarbonate, in consequence of its disagreeable taste; but in the dried state, when deprived by heat of its water of crystallization, it is much used as an alternative. In dyspepsia attended with acidity, a combination of the dried carbonate with blue pill and rhubarb pill is often extremely useful. As it has a very acrid taste, it should be combined, if given in powder, with some bland substance, such as compound tragacanth powder. *Solution of chlorinated soda* (known also as *solution of chloride of soda*, *chlorinated soda*, *hypochlorite of soda*, and *Labarraque's disinfecting liquor*) is preferable to hypochlorite of lime in destroying noxious effluvia, as the salt which is left does not deliquesce, while chloride of calcium is very deliquescent. It may be applied locally to foul ulcers, either in lotion (2 drams to 8 ounces of water), or as a poultice with linseed meal and boiling water. *Phosphate of soda*, $\text{Na}_2\text{HPO}_4 + 12\text{H}_2\text{O}$, known also as *tasteless purging salts*, is a mild saline purgative, with a far less unpleasant taste than sulphate of magnesia. It is especially adapted as a purgative for persons affected with deposits of red gravel (lithic or uric acid) in the urine. The dose varies from half an ounce to 2 ounces, and it may be given in broth, to which it imparts only a saline taste. *Sulphate of soda*, and *tartrate of soda and potash*, have been already described under their ordinary names of *Glauber's salt* (q.v.) and *Rochelle salt* (q.v.).

SODOM, APPLE OF, the name given to the fruit of a species of *solanum* (q.v.). But it seems that the true APPLE OF SODOM, or MAD APPLE, of the shores of the Dead sea, mentioned by Strabo, Tacitus, and Josephus, and described as beautiful to the eye, but filling the mouth with bitter ashes if tasted, is a kind of gall, growing on dwarf oaks, and produced by a species of gall-insect, which has received the name of *cynips insana*. These galls are about 2 in. long, and $1\frac{1}{2}$ in. in diameter, of a beautiful, rich, glossy, purplish-red color, and filled with an intensely bitter, porous, and easily pulverized substance, surrounding the insect. They are attached to the twigs in a curious manner, different from other galls, the narrow end "rising upward on each side, and bending inward, so as to clasp the extremity of the twig somewhat like a pair of wide and curved nippers."

SODOM AND GOMOR'RAH, two ancient cities of Syria, almost invariably spoken of in conjunction in the Bible, and forming with Admah, Zeboiim, and other towns, the "cities of the plain," which on account of the enormous wickedness of their inhabitants (the nature of which is indicated in the term sodomy), are said to have been overthrown—not submerged—by some terrible convulsion of nature. Modern writers on sacred topography are not agreed as to the precise site to be assigned to these cities, no trace of which now remains; the majority holding that they stood on the southern shore of the Dead sea, near the salt hill of Usdum; while others, again, apparently with more countenance from the Scripture narrative (Gen. xiii. 10-13) maintain that Sodom, Gemorrah, and the other "cities of the plain," stood in the "circle or plain of the Jordan," e. from Bethel and Ai, near where the river discharges itself into the Dead sea. The popular belief, that the cities were miraculously overwhelmed by the waters of the Dead sea, and that their remains may still be seen at the bottom, is an idle tale of superstitious travelers, uncoun tenanced either by fact or by the terms employed by Scripture to describe the catastrophe.

SODOMY, an unnatural crime, is punishable with penal servitude for life, or any term not less than ten years, and the attempt to commit it is punishable with penal servitude from three to ten years. In Scotland it is still nominally a capital offense, but never punished except by penal servitude and imprisonment.

SODOR AND MAN, BISHOPRIC OF. See **HEBRIDES** and **MAN**.

SOEST (pronounced SOHST), a t. of Prussia, province of Westphalia, 34 m. s.e. of Münster by railway, was, during the middle ages, a Hanse-town and fortress, and, in point of commercial importance, one of the foremost cities of Germany, with a pop. of from 60,000 to 70,000. Now, however, it is only the shadow of its former self; but relics of its ancient splendors still survive in its numerous and magnificent churches, of which the finest is the "meadow church," restored in 1850. Its municipal law, the *jus susatense*, was the oldest in Germany, and served as the model for the other imperial free-towns, Lübeck, Hamburg, etc. At present Soest has some trade in corn, and a number of manufactories and breweries. Pop. '95, 15,407.

SOFA LA, or, as the old geographers sometimes wrote it, **CEFOLA**, is the name given rather indefinitely to that portion of the s.e. coast of Africa extending from the delta of the Zambezi (Quama of old geographers) as far s. as the Rio Maneci or Delagoa bay, or from lat. 18° to 26° s., although some modern geographers consider cape Corrientes as its southern limit. This stretch of coast now comprehends the Portuguese captaincies of Rio de Senna, Tetè, Sofala, and Inhambane, besides the regions round Delagoa bay, nominally under the control of the crown of Portugal, the extent inland being generally limited by the mountain region which runs parallel to the coast of southern Africa, and forming a belt of low country about 150 m. wide, full of swamps, densely wooded, and generally unfavorable to European life.

Sofala, in common with the remainder of the coast of eastern Africa, was conquered by the Arabs between the 8th and 12th c.; it was visited in 1480 by Pedroa Cavalho, a Portuguese captain, from Abyssinia, before the route by sea to India was discovered. In 1500 the Portuguese, under Albuquerque, commenced making settlements on this coast, and built a strong fort on an island in the mouth of the Rio de Sofala, near a town which was founded 200 years before by the Arabs, and which still exists, although in a very decayed state. The inland region at the back of the coast district, now occupied by the Transvaal Boers toward the s., or by Moselikatse and his Amatabele to the n., and stretching away northward for an indefinite distance, formed the celebrated though mythical empire of Monomotapa, the accounts of which by the early travelers are perfectly marvelous. Sofala was considered by the old geographers as a very rich, gold-producing country, and was judged by some to be the Golden Ophir to which king Solomon every three years sent a fleet of ships; and, indeed, it seems to have derived its name from the Greek *sophira*, by which Ophir is translated in the Septuagint. Lopez tells us that in his time the inhabitants related that the gold-mines of Sofala afford yearly two millions of metrigals—every metrigal accounted for a ducat. Whatever may have been its former reputation, Sofala has long ceased to be a gold-producing country to any considerable extent.

An old writer says: "Great wild elephants overspread the country, which the natives neither know how to tame nor manage; nor are lions, bears, stags, or harts and boars fewer; besides, sea-horses sport themselves in the Quama." This description is pretty accurate, even at the present day, if we omit the bears, and call the stags antelopes; for the elephants, rhinoceroses, and other large game, driven away from the highlands in the interior by the pursuit of the cape hunters, have descended into the coast lowlands, where the dense bushy nature of the country, and its extreme unhealthiness, protect them from extermination, although such keen sportsmen as McCabe, Chapman, and Edwards have not feared to follow them there.

The most northern regions of Sofala are the captaincies of Rio de Senna and Tetè, formerly called Matuka, which include the country on the right bank of the Zambezi, sloping down from the Malappo mountains, which bound its basin on the south. The principal places are Tetè, in lat. 16° 12' s., long. 31° 50' e.; and Senna, in lat. 17° 30', long. 34° 40'. The middle region comprises the captaincy of Sofala, the seat of government

being at the town or fort of that name, in the bay of Massangane; lat. 20° 12', long. 34° 40'. Inhambane is the name of the most southerly captaincy, in lat. 23° 51', and long. 35° 20'. There are other inconsiderable Portuguese factories along the coast of Inhambana, s. of Inhambane, Mambone, and Lorenzo Marquez, in Delagoa bay, where a Portuguese governor resides.

Although nominally under Portuguese rule, yet the authority of that government rarely extends outside of the walls of the miserable forts held by its agents. It is computed that on the whole of the Portuguese settlements on the e. coast of Africa there are not more than 500 colonists of European birth. Trading-parties of Dutch Boers from the Transvaal territory occasionally visit the factories of Inhambane, Sofala, and Lorenzo Marquez, to purchase articles of European manufacture in exchange for ivory, wax, timber, etc. The natives, generally, are of the negro type, gradually approximating to the more intellectual Zulu Kaffir as we proceed from the Zambezi to Delagoa bay.

The principal exports from this region are ivory, beeswax, hides, and rhinoceroses' horns, while a considerable clandestine traffic is said to be carried on in slaves. Considerable amounts of gunpowder, lead, coffee, and European clothes find their way up from the coast to the Boer settlements in the highlands of the interior. The coast-line is generally low and sandy, and dangerous on account of shoals and sand-banks. A group of islands, called Bazaruta, lie off the coast n. of cape St. Sebastian, in lat. 22° s. The best harbor is that of Inhambane, and ships may ascend to the town, about 8 m. from the mouth of the river. The harbor at the mouth of the Rio de Sofala is difficult of access on account of its bar.

SOFFIT, a small ceiling, formed into panels, as over windows, ingoings of doors, staircases, etc.

SOFIA. See **SOPHIA**.

SOFTAS, in the early days of Mohammedism, were paupers, who loitered about the mosques and had benches outside on which they slept, from which circumstance they were called *softas*, "men of the bench." In time the term came to be applied to all attached to the mosques, and in particular to the students of the higher theological branches, thus resembling the body of "fellows" of an English college. They exercise great political influence over the fanatical lower classes. There are now about 16,000 of the softas.

SOFTENING AND INDURATION are terms used to express a pathological diminution and augmentation of the consistence of the tissues or organs of the body. These changes may arise from inflammatory action; but softening may also be induced by causes totally distinct from inflammation, as, for example, from a deficient supply of blood, from scrofula or cancer, or from long-continued functional inactivity (as in the case of paralyzed muscles). Among the parts liable to both softening and induration are the brain and spinal cord, the heart, the lungs, the serous and mucous membranes, the liver, the spleen, the kidneys, the uterus, and the bones and cartilages.

SOFT-GRASS, *Holcus*, a genus of grasses having a lax panicle, two-flowered spikelets, with two nearly equal glumes. The species are not numerous. The English name is derived from the soft and abundant pubescence of the British species, which are two in number—**CREEPING S.** (*H. mollis*), and **WOOLY S.** or **MEADOW S.** (*H. lanatus*), both perennial grasses and both very common. Meadow S. is found most abundantly on damp, moorish, or peaty soils, on which it is sometimes sown, as it yields abundant herbage; but it is very inferior to some other grasses, and therefore unsuitable for rich meadows and pastures. Creeping S. is generally found on dry, sandy, or other light soils, and very much resembles meadow S., but is still more downy and of smaller size. The roots sometimes extend 5 or 6 ft. in a season. The roots contain much nutritious matter, and are a very acceptable food to horses and cattle, but especially to hogs, which grub them up for themselves when they have opportunity.

SOGDIA'NA, in ancient geography, a country in Asia, bounded on the n. by the Jaxartes, which divided it from Scythia; on the s.w. by the Oxus, which divided it from Bactria; and on the n.w. by the sea of Aral. It was conquered by the Persians in the reign of Cyrus; was invaded by Alexander, after whose time it fell into the power of Syria.

SOHAR', a t. on the sea of Oman, in Oman, Arabia; capital of the province of Batina; pop. 4,000-5,000. It is defended by a wall, and has a castle. Woolen stuffs, carpets, fire-arms, and silk are the chief manufactures, and there is some working of gold and silver. Its trade has been taken away by Muscat.

SOHN, KARL FERDINAND, 1805-67; b. Berlin, Prussia; studied art at the Berlin academy, at Düsseldorf, and in Italy. He painted a large number of pictures, all noted for the rich coloring of the female figures. Among the best were "The Two Leonoras;" "Romeo and Juliet;" "The Lute Player;" and "The Four Seasons." From 1838 to 1856 he was professor at the Düsseldorf art academy.

SOIGNIES, a t. of Belgium, province of Hainault, 22 m. s.w. of Brussels by railway. Its church of St. Vincent Maldegairre, founded in the 10th c., if not earlier, is probably the oldest in Belgium. Soignies has flax-spinning and bleach-works, trade in stone and lime, and large fairs. Pop. '94, 9245.—Some m. to the n.e., in the province of South Brabant,

lies the forest of Soignies, at whose southern extremity is situated the famous field of Waterloo.

SOILS consist of the disintegrated materials of the hard crust of the earth, mixed with decayed vegetable matter. This disintegration is effected partly by the chemical action of oxygen, carbonic acid, and the other acid or alkaline substances brought by the atmosphere to bear upon rocks, and partly by the wearing action of water in a fluid state or in the form of glaciers, or by its bursting force when frozen in deep clefts. The soils produced by running water, floods, and tides, are found along the banks or at the mouths of rivers, and are generally called *alluvial soils*; those produced by glacier action are known as *drift soils*; and both are generally found at a great distance from the rocks of whose disintegrated materials they are composed. But by far the greater mass of soil has been produced in the other way above mentioned, by the gradual weathering of rock under atmospheric influence; and it is generally found adjoining or overlying the rocks from which it has been produced. Immediately beneath the soil or stratum of earth which affords nourishment to plants, is a mass of earth or rock, unmixed with decayed vegetable matter, to which the term *subsoil* is applied. The subsoil may or may not be similar in its geological constitution to the soil; and from the absence of vegetable matter, is generally lighter in color than the latter.

Every species of rock has produced its soil; but the older formations, from their greater hardness and power of resistance to atmospheric action, produce, in proportion to their exposed surface, less soil than do the secondary and tertiary groups. The fertility of soils has no relation to the chronological succession of the strata of the earth's crust; thus, igneous rocks produce a naturally fertile soil, though they seldom become thoroughly disintegrated; metamorphic or transition rocks furnish one of poor quality, as does also the greater portion of the Silurian system; while to the vast mass of the secondary group of deposits, especially the Devonian system, with its old red sandstone, and limestone, and marl beds, the mountain limestone of the carboniferous system, and the new red sandstone of the Permian and triassic systems, belong some of the richest tracts in Great Britain, though numerous members of the same group supply barren and ungrateful soils. The lias, and oolitic, and wealden systems generally supply clay-soils of considerable fertility, but of the densest texture and most intractable character; soils formed from the cretaceous group are extremely variable in quality; but when the chalk is largely mixed with sand or clay, they exhibit a considerable degree of fertility; however, they have one great general defect, that of not sufficiently retaining moisture. The soils produced from the tertiary formations possess no general characteristics, being sometimes extremely fertile, and again almost wholly barren.

But however soils may vary in a geological point of view, they are all resolvable into a few elements—viz., the various compounds of aluminium, iron, manganese, the four alkaline metals, the seven alkaline earths, and the four organic elementary substances. These eighteen bodies supply, singly or in combination, all the constituents necessary to the growth of plants, each of them having its own portion of the plant to sustain—the silica producing strength and rigidity in the stems; alumina giving tenacity to the soil, and so rendering it a stable support; magnesia perfecting the seeds; iron absorbing oxygen and ammonia from the atmosphere, and giving it up as required; and so on. Of these ingredients, silica, alumina, lime, along with matter derived from organic bodies, constitute the bulk of the soil; the other ingredients existing only in minute quantity, and hence is derived the common quadruple division of soils into *siliceous or sandy, argillaceous or clayey, calcareous, and humous*.

It is not sufficient that soil possesses all the ingredients necessary for rendering it fertile, or that these ingredients are in a sufficiently comminuted state to enable them to be absorbed; there is besides a certain physical or mechanical condition necessary. Thus, for example, a soil which possesses too great a proportion of silica is too little retentive of moisture, and has not sufficient consistency of texture to be an effective support of tall plants; one in which calcareous matter abounds is also too dry a soil; while if alumina predominates, it is generally too retentive of moisture; and a great excess of the last-named ingredient renders it so extremely tenacious as to be almost incapable of reduction to a proper mechanical state. The soil which is physically most perfect is composed of about equal proportions of the two great ingredients, silica and alumina, and is generally known as *loam*, being distinguished into *clay loam or sandy loam*, according as the alumina or silica sensibly predominates. But the physical qualities of soils do not wholly depend upon their composition; they are also largely affected by the depth of the soil itself, and the quality of the subsoil. Should the soil and subsoil be both retentive, or both porous, the defects of these states as to dryness or moisture are considerably increased; if porous and retentive soils of good depth rest upon subsoils of a contrary character, the defects of the former are to a considerable degree amended. But the advantages and disadvantages of these conditions must to a very large extent be judged by the prevalent character of the climate, a somewhat porous subsoil in a cold moist district being generally preferable, and *vice versa*. Each of these classes of soils, when possessed of the chemical ingredients in quantity sufficient for the wants of plants, and of a texture favorable to their growth, excels in the production of certain species. Thus, the clay loams are unequalled for the production of wheat and

beans; the sandy loams for barley, rye, and the various root-crops; while both are well suited for the growth of the other cultivated plants, or for perennial pasture.

Besides the calcareous and marly soils which may be, according to circumstances, classed as a clayey or sandy soil, rarely the former, there is the humous soil, which possesses characteristics peculiarly its own. It is not devoid of consistency like the sandy, or retentive of moisture like the clayey soils, but in its natural state is spongy and elastic in texture, of a remarkably dark color, and, when dried, becomes inflammable, and even when much improved by culture retains these characteristics in a considerable degree. It consists wholly, or to a great extent, of vegetable matter, and is found in perfection in forests of ancient date, as the woods of America, and in the peculiar form of peat (q.v.) in many parts of the world. In its ordinarily decomposed condition, it is at once the richest of soils; but in the state of peat it calls for long-continued drainage, and the application of decomposing agents, before it can be rendered of service in the production of crops.

Improvement of a soil must, then, as is seen from the foregoing considerations, be effected either by supplying the substances required by plants to a soil which is deficient in them, by altering its depth and texture, and by removing excess, or supplying deficiency of moisture. The first of these objects is effected by the introduction and incorporation of manures (q.v.) with the soil, care being taken that the manure contains the requisite ingredients, and in such a condition as to be assimilable by plants either directly or indirectly through the soil, and by the more thorough exposure of the soil to the action of the atmosphere; the second is effected by the admixture of marl or clay with sandy, chalky, or peat soils, of lime, ashes, or burned clay, with tenacious clay soils, or by the mixture of the subsoil (if differing in quality) with the soil by means of the subsoil plow, or by more complete surface-tillage, and free exposure to the action of frost; and the third is accomplished by drainage (q.v.) and irrigation (q.v.). The fertility and chemical composition of a soil may be approximately determined by inspection of its color and texture; but more accurately, as well as its dryness or moisture, excess or defect of silica and alumina, by the predominance of certain species of wild plants or weeds.

SOISSONS, a t. of France, in the department of Aisne, stands in a fertile vale on the banks of the river Aisne, about 65 m. n.e. of Paris. Soissons is the key of Paris for an army invading France from the Netherlands, and is the meeting-point of six military roads. The principal building is the cathedral of Notre Dame, founded in the 12th c., the library of which contains many rare MSS. There are also some remains of the great castellated abbey of St. Jean des Vignes, where Thomas à Becket found refuge when in exile. Quite near to Soissons is an institute for "deaf and dumb," which occupies the site of the famous abbey of St. Médard, where Clotaire and Sigebert were buried. Soissons has manufactures of linen, woollens, and cottons. Pop. '91, 11,352. Soissons is one of the oldest towns in France, and was celebrated even in the time of the Romans, when it bore the names first of *Noviodunum*, and afterward of *Augusta Suessionum*; hence its modern name of Soissons. It was the last Roman stronghold in Gaul that withstood the arms of Clovis, who here overthrew Syagrius, the Roman commander, in 486, and made it the seat of the Frankish monarchy, which it long continued to be.

SOJOURNER TRUTH, 1775-1883; born Ulster county, N. Y.; died Battle Creek, Mich. She was born a slave and was known by the name of Isabella until she gained her freedom in 1827. She was uneducated, but became an enthusiast in religion, and after her emancipation delivered lectures in different parts of the country on slavery and temperance, and held religious meetings. She was a great admirer of Abraham Lincoln, and visited him at the White House. Mrs. Harriet Beecher Stowe wrote what is known as Sojourner Truth's *Book of Life*, a new edition of which appeared, 1876. Though ignorant she had much native force of character, a shrewd wit, and evident sincerity.

SOKOTO, a kingdom of Africa, in Sudan, to the s.w. of lake Tchad, and separated from it by the state of Bornu (q.v.). Area, 124,900 sq. miles. The number of inhabitants is estimated at 10,000,000. A formidable military force is maintained.—*Sókoto*, the capital, stands on the Zirmie, an affluent of the Sókoto, which flows into the Quorra. Manufactures are in a flourishing condition. Its market is of great importance; it trades in raw silk, glass-wares, and perfumery, carries on extensive and famous manufactures of leather goods, and has about 30,000 inhabitants.

SOLANACEÆ, or **SOLANÆÆ**, a natural order of exogenous plants, mostly herbaceous plants and shrubs, but including a few tropical trees. The leaves are mostly alternate, undivided, or lobed, without stipules. The flowers are regular, or nearly so; the calyx and corolla generally 5-cleft; the stamens generally five. The fruit is either a capsule or a berry, mostly 2-celled. The plants of this order are mostly natives of tropical countries, a small number extending into the temperate and moderately cold climates of both hemispheres; in the coldest regions they are entirely wanting. They are mostly distinguished by an offensive smell, and by containing in greater or less abundance a narcotic, poisonous substance, usually associated with a pungent principle, and some of them are among the most active poisons. Sometimes the narcotic substance predominates as in mandrake (q.v.) and henbane (q.v.); sometimes the pungent substance pre-

dominates, or is alone present, as in Cayenne pepper (*capsicum*); sometimes both are present in more or less equal proportion, as in tobacco, thorn-apple, or stramonium, and belladonna. The fruit is generally poisonous; but that of a considerable number of species, in which acids and mucilage predominate, is eatable, as, for instance, the berries of the winter cherry and other species of *physalis*, those of the egg-plant (q.v.) and some other species of *solanum*, and of the love-apple (*lycopersicum*). The tubers, which occur in a few species, contain much starch, and serve as an article of food, of which the potato is the chief example. The seeds of all contain a fixed oil, which in the s. of Germany is expressed from the seeds of the belladonna itself.

SOLANDER, DANIEL CHARLES, LL.D., 1736-82; b. Sweden; studied with Linnæus; graduated in medicine at the university of Upsala; visited England in 1760; accompanied sir Joseph Banks on the voyage round the world with Capt. Cook; appointed under-librarian of the British museum, 1773, to which he left a collection of valuable manuscripts. He wrote a *Description of the Collection of Petrifications found in Hampshire*, and *Observations on Natural History in Cook's Voyage*.

SOLAN GOOSE. See GANNET.

SOLA'NO. See SIMOOM.

SOLA'NO, a co. in central California, bounded on the s. by the strait of Carquinez and Suisun bay; crossed by the California Pacific railroad; about 960 sq.m.; pop. '90, 20,946, chiefly of American birth. The surface is varied. The soil is fertile. The principal productions are cattle, wheat, barley, wool, and wine. Co. seat, Fairfield.

SOLA NUM, a genus of plants of the natural order *solanaceæ*, containing a great number of species, which are distributed all over the world but are particularly abundant in South America and the West Indies. Some of the species are herbaceous, others are shrubs; some of them unarmed and some of them spiny; many covered with a down of star-like hairs. The flowers are in false umbels, or almost in panicles; seldom in racemes, or solitary. The anthers open by two holes at the top. The berries are two-celled, and contain many smooth seeds. The species of this genus almost always contain in all their parts a poisonous alkaloid, *solanine*, in greater or less quantity, sometimes so much that the leaves or the berries cannot be eaten without danger, while in a few species the quantity present is so small as to be insignificant, and these parts are eaten freely, being agreeable and harmless. By far the most important of all the species is *S. tuberosum*, the potato (q.v.), in which, however, *solanine* is found in considerable quantity, so that not only the herbage, but the juice of the raw tubers is unwholesome. Of the species with eatable fruit, the principal is *S. melongena*, the egg-plant (q.v.).—The only British species are *S. dulcamara*, the bittersweet (q.v.), and *S. nigrum*, the common nightshade (q.v.), both of which possess poisonous and medicinal qualities. The berries, leaves, bark, and roots of various species are employed for different medicinal uses in the warm countries of which they are natives; but their properties have not yet been sufficiently investigated. The berries of *S. saponaceum* are used as a substitute for soap.

SOLAR, an upper chamber or loft. The only private apartment in the old baronial halls was so called. It was placed over the pantry, at one end of the hall, and served as parlor and sleeping apartment for the baron and his family.

SOLAR CYCLE. See PERIOD.

SOLAR MICROSCOPE, an instrument for producing magnified images of minute objects on a screen, through the agency of the sun's rays. The tube of the microscope is conical, and is fastened to the interior side of a closed window-shutter over a hole in the latter; a reflector, placed at the hole so that the rays of light may fall on it, is so adjusted as to throw them along the tube. They are then collected by a powerful double convex lens, and thrown on the object, which is inserted into the tube at the focus of the lens by a slit at the side. After passing the object, the rays again pass through a single lens, or a combination of lenses, make their exit from the tube, and fall on a screen, on which they depict a magnified image of the object. We have here supposed the object to be so translucent as to allow of the passage of rays through it. Should it be opaque, the rays of light reflected from the mirror are caught by the double convex lens, which concentrates them on another mirror near the opposite end of the tube; they are thence reflected upon the back of the object, and diverge on the system of lenses at the mouth, which form the image. Instead of the sun's rays, the oxyhydrogen lime-light (and more recently the electric light) has been employed, its rays being thrown on the double-convex condenser by means of a concave reflector, in whose focus the piece of burning lime or marble is situated. The instrument is hence often called the *oxyhydrogen microscope*.

SOLAR SYSTEM. The planets and comets which circle round the sun combine with it to form a system to which is given the name of *solar* or *planetary* system. It is probable that each star is the center of an analogous system. This, however, is merely a matter of speculation, and in no way practically concerns us; but it is different with the solar system. No change of much magnitude can take place in the elements of the planets without having effect on the earth and its inhabitants, on account of the mutual attractions of the planets for each other; in fact, they appear as members of one isolated family, bound together by common ties, which could not be ruptured in the case of one

individual without communicating a general shock to the others. The various members of the solar system are noticed under PLANETS, PLANETOIDS, COMET, SUN, MOON, SATELLITES, METEORS; and their motions are treated of under GRAVITATION, CENTRAL FORCES, PRECESSION, etc., so that it only remains here to give the more interesting numerical facts connected with them, which can be done most conveniently in a tabular form.

Name.	Diameter in Miles.	Density, Earth's being = 1.	Mass, Sun's being = 1.	Distance from Sun in Millions of Miles.	Period of Revolution in Days.	Velocity in Orbit— Miles per Hour.	Velocity of Rotation at Equator— Miles per Hour.
Mercury.....	2,962	1.24	$\frac{1}{4869751}$	35	88	105,330	386
Venus.....	7,549	9.92	$\frac{1}{401211}$	66	225	77,050	1,010
Earth.....	7,912	1.00	$\frac{1}{314766}$	91	365 $\frac{1}{4}$	65,533	1,040
Mars.....	4,920	0.52	$\frac{1}{3548247}$	139	687	53,090	638
Minor planets.....							
Jupiter.....	88,390	0.22	$\frac{1}{1046}$	476	4,332	28,744	27,985
Saturn.....	71,904	0.12	$\frac{1}{3496}$	872	10,759	21,221	21,538
Uranus.....	33,024	0.18	$\frac{1}{24869}$	1,754	30,687	14,963	10,921
Neptune.....	36,630	0.17	$\frac{1}{16760}$	2,746	60,127	11,958	?
Sun.....	852,584	0.25	$\frac{1}{1}$	*	*	*	4,407
Moon.....	2,153	0.63	$\frac{1}{34490744}$	*	*	2,273	10

SOLATIUM, in Scotch law, means compensation for wounded feelings, and is something over and above the ordinary pecuniary value of the damage. In America such a ground of damages is not in strict principle admitted, but in practice there is no substantial difference.

SOLDER, an easily fusible alloy used for joining metals. Solders are of various kinds, suited to different metals. They always require to be used with a flux, such as borax, resin, chloride of zinc, sal-ammoniac, etc. The following are the principal solders: *Pewterers' solder*—bismuth, 2 parts; lead, 4 parts; tin, 3 parts. This can be used for coarse work by the direct application of naked fire; but for fine work, requiring the protection of a muffle-furnace, the composition must be bismuth and lead, of each 1 part; tin, 2 parts. *Plumbers' solder* for coarse work—tin, 1 part; lead, 3 parts. For finer work—tin, 2 parts; lead, 1 part. *Spelter solder*—12 parts zinc to 16 parts of copper. *Soft spelter solder*—equal parts of copper and zinc. When solders are applied in the common work of plumbers and tinmen, a tool called the soldering-iron is used: this is made red-hot, and affords a convenient means of applying fire direct to the solder and flux. Although called the soldering-iron, the portion of the tool to be heated must be of copper. In many manufactures, a flame produced by a mixture of atmospheric air and coal-gas is used to melt the solder; and for fine work, such as jewelry, the common blow-pipe is often used.

SOLDIER is one who enters into an obligation to some chieftain or government to devote for a specified period his whole energies, and even if necessary his life itself, to the furtherance of the policy of that chief or government. The consideration may be immediate pay, or prospective reward; or the contract may be merely an act of loyal devotion. The acknowledgment of the service by the employer constitutes the man a recognized soldier, and empowers him to take life in open warfare, without being liable to the penalties of an assassin and a robber. The fact of being mercenary, that is, of receiving wages for killing and being killed, does not render a soldier's trade less honorable. He bears arms that others may be able to do without them; he is precluded by the exigencies of military training from maintaining himself by peaceful occupation; and it is therefore but fair that those whom he protects should support him, and give him, over and above actual maintenance, reasonable wages for the continual risk of his life. If a man willingly enlist himself as a soldier in what he believes to be an unrighteous cause, it is an act of moral turpitude; but when once enlisted, the soldier ceases to be morally responsible for the justice or iniquity of the war he wages; that rests with his employer. Obedience, implicit and entire, is his sole virtue. The maxim is, "The military force never deliberates, but always obeys." See ENLISTMENT, MARTIAL LAW WAR, etc.

SOLDIERS' HOMES. The first institution of this character established by the U. S. government was founded by act of congress passed Mar. 3, 1851—"to found a military asylum for the relief and support of invalid and disabled soldiers of the army of the United States." The funds to conduct this institution originated in tribute levied by Gen. Scott on the City of Mexico, after its capture, for the benefit of the U. S. army. The act referred to above defined the beneficiaries thereof to be soldiers who had served 20 years; pensioners, after surrendering their pensions; and persons disabled by wounds or sickness incurred in the military service of their country. Besides the sum of money already named, the act appropriated an unexpended balance of a previous appropriation to the same purpose, and placed the institution in charge of a board of commissioners, to include the gen. of the army and those general officers commanding the eastern

and western military divisions; and the chiefs of the medical, pay, commissary, and quartermaster's departments, and the adjt.gen. of the army. This portion of the act was revised by the act of Mar. 3, 1859, reducing the number of commissioners to include only the adjt.gen., surgeon-gen., and commissary-gen. of subsistence. Various temporary asylums were erected or leased between 1851 and 1857. In 1851 a purchase of land was made for this purpose in the city of Washington, distant about $3\frac{1}{2}$ m. from the Capitol; including, with later purchases, about 460 acres. This is, in fact, the only permanently established soldiers' home under the act of 1851. It comprehends a farm, orchards, gardens, park, etc.; the building is white marble, calculated to accommodate about 500 inmates at one time; and a chapel, well-stocked library, and hospital complete the excellent service of the institution. The number of inmates of this establishment up to the year 1885 was in the neighborhood of 3,000. Besides this one there were founded under the acts of 1865 and 1873 homes for volunteer soldiers of the war of 1861-65 in Chelsea, near Augusta, Me.; Hampton, Va.; Dayton, Ohio; and Milwaukee, Wis. Appropriations are made annually by congress for the support of these institutions. Similar institutions are the Chelsea hospital, Eng.; Kilmainham hospital, near Dublin; a like establishment in Berlin; and the Hôtel des Invalides, Paris.

SOLDO. See **SOLIDUS**.

SOLE, *Solea*, a genus of flat-fishes (*pleuronectidæ*), of an oblong form, with a rounded muzzle, which almost always advances beyond the mouth; the mouth twisted to the side opposite to that on which the eyes are situated, which is usually the right side, although individuals of the same species are found having the eyes and color on the left side; the teeth very small in both jaws, but only in the under part of the mouth (the side opposite to the eyes); the lateral line straight; pectoral fins on both sides; the dorsal and anal fins long, and extending to the tail, but distinct from the tail-fin.

SOL ECISM. A solecism is the term applied to any violation of the grammar or idiom of a language, or of the usages of society. It is said to be derived from the city of Soli in Cilicia, whose inhabitants spoke very bad Greek, in consequence of their intercourse with the Cilician natives, and provoked the fastidious Athenians to coin the epithet.

SOLEMN LEAGUE AND COVENANT. See **COVENANTS, THE**.

SOL EN, a genus of lamellibranchiate mollusks, the type of the family *solenidæ*, remarkable for the wide gaping of the shell at both ends, and the large and muscular foot. In the genus solen the shell is remarkably elongated, its apparent length being, however, more strictly its breadth. From its form the names **RAZOR-SHELL** and **RAZOR-FISH** are often given to it. The species are numerous, and inhabit the sands of all seas except in the coldest parts of the world.

SOLENHOFEN LITHOGRAPHIC STONE, a famous deposit of limestone of upper oolite age, which from its fine-grained and homogeneous texture is admirably adapted for lithographic purposes. It occurs near Aichstadt in Bavaria, and has been extensively quarried since the invention of lithography. The quarrymen work upon the lines of stratification, which are beautifully parallel, and all the fossils are found upon the natural surfaces of the beds, and present an impression and cast in almost every instance. The rock is quarried to a depth of 80 or 90 feet. It is of special interest to the geologist from the singular assemblage of fossil remains which are preserved in it with wonderful minuteness. See **ARCHÆOPTERYX**.

SOLENOID, a coil of wire used for producing magnetic effects by electric currents. See **ELECTRICITY**; **MAGNETOS**.

SOL ENT, the name of the western portion of the strait that intervenes between the Isle of Wight and the main-land of England. At Hurst castle, which guards its entrance on the s. w., the Solent is less than a mile in breadth; and along this narrow passage the tide flows with a rapidity which at certain times no boat can stem. The castle itself consists of a central tower or keep, surrounded by several smaller towers, and mounted with heavy guns.

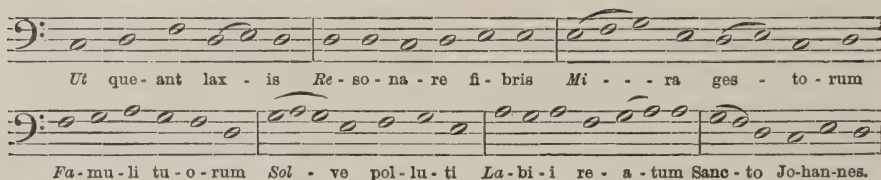
SOLEURE (Ger. *Solothurn*), a canton in the n. of Switzerland, bounded on the w. and s. by Bern, and on the n. and e. by Basel and Aargau. Area 302 sq. m.; pop. '94, 89,290, mostly Roman Catholics. The greater portion of the canton is fertile and well cultivated, especially along the banks of the Aar. Even the rugged and hilly districts are sources of wealth on account of their fine pasturage. Besides grain, the principal products of Soleure are fruit, wine, flax, and cotton.

SOLEURE, (Ger. *Solothurn*), capital of the canton, is situated on the Aar, 16, m. n.e. of Bern by railway. The scenery in its vicinity is among the loveliest in Switzerland. The Aar flows through the town, dividing it into two unequal parts, which are connected by two wooden bridges. The most notable building is the cathedral of St. Ursinus, with a cupola and façade of Corinthian columns, reckoned the most costly cathedral in Switzerland. Soleure has some manufactures, but derives its chief industrial importance from its transit-trade. Pop. '90, 8460. Near to Soleure are the baths of Weissenstein.

SOLFATA RA (Fr. *Soufrière*, Ger. *Schwefelgrube* or *Schwefelsee*), the Italian name for such volcanoes as, having become less active than volcanoes in an actual state of eruption, only exhale gases. The most notable of them are found in Italy, in the Antilles,

in the interior of Asia, and in Java. The Solfatara of Pozzuoli, near Naples, is an irregular plain, 1368 ft. long, and 1310 ft. broad, almost surrounded by broken hills of pumiceous tufa, the ancient walls of the crater. From the crevices of the rocks, steam or noxious gases, chiefly sulphureted hydrogen, mixed with a minute quantity of muriatic acid and muriate of ammonia, exhale. In the cracks and fissures of the rocks, sulphur, alum, and sulphate of iron abound. The vapors exhaled are used as medicinal baths, and huts, constructed of boards, have been erected in which the baths may be obtained. The Soufrière of Morne-Garou, in the isle of St. Vincent, Lesser Antilles, about three miles in circuit, and over 500 ft. in depth, has in its center a cone, the summit of which is covered with sulphur.

SOLFEGGIO, in music, seven syllables, which are sometimes used as a nomenclature for the seven notes of the scale. In singing, the art of applying these syllables to the notes as an exercise for the learner is called *solmization*. The syllables are *ut* (or *do*), *re*, *mi*, *fa*, *sol*, *la*, and *si*. The first six are the commencement of the lines of an ancient monkish hymn to John the Baptist, which had this peculiarity, that the first syllable of each line was sung to a note one degree higher than the first syllable of the line that preceded, so as to present the type of a scale:



These syllables are said to have been first made use of by Guido of Arezzo, in the 11th c.; and Le Maire, a French musician of the 17th c., added to them *si*, for the seventh of the scale. When applied to the key of C, their equivalents, in the ordinary musical nomenclature, are:

Do	re	mi	fa	sol	la	si	do
C	D	E	F	G	A	B	C

These syllables may, however, according to the more modern practice of teachers in this country, be applied to other keys, with *do* always as the key-note, so as to express, not the absolute pitch of a note, but its relation to the key-note; and thus used, they are thought to be of service to the learner in keeping prominently before him the principle that there is but one scale in music, which is raised or lowered according to the pitch of the key. Different variations in the way of using the syllables have recently given rise to various supposed short and easy modes of teaching singing, the best known of which is Mr. Curwen's system of "tonic solmization," where the ordinary notation of the staff, with its lines and spaces, is entirely rejected, and a notation substituted which is formed of the solfeggio syllables, used to express not pitch but relation to the key-note. One disadvantage of this and similar schemes is the entire withdrawal of the direct indication of the pitch of the sounds to the eye, by the notes ascending as the sounds ascend, which is so beautiful a feature of the common notation. And even if it be granted that the first rudiments of music can, as has been asserted, be taken up with remarkable ease by the pupil who learns on the tonic sol-fa system, it is undeniable that as soon as he comes in contact with notes of different lengths, or begins to modulate from one key to another, he is beset with serious difficulties.

SOLFERINO, a village of northern Italy, province of Brescia, 20 m. n.w. of Mantua, with, '81, 1284 inhabitants. It stands on a hill, and has a tower called the Spy of Italy (*Spia d'Italia*), from which the whole plain of Lombardy may be seen. There, in 1796, the French conquered the Austrians. On June 24, 1859, Solferino was again the scene of an overwhelming victory obtained by the French and Italians over the Austrians.

SOLICITING, the offense committed by the prostitute in the streets, in calling attention to herself, and punishable in all cities both in Europe and America, though in London the police do not notice the offense unless complaint is made. See **PROSTITUTION**.

SOLICITOR. See **ATTORNEYS**.

SOLICITOR-GENERAL, the name given to one of the law-officers of the crown. The solicitor-general of England has powers similar to those of the attorney general (q.v.), to whom he gives aid in discharging his functions. During the absence of the attorney-general, he may do every act and execute every authority of that officer. He is, *ex officio*, one of the commissioners of patents.

SOLICITOR TO THE TREASURY, an English official who acts for the government in all legal proceedings. He has also to act as solicitor for the three secretaries of state, the privy council office, the board of trade, the mint, the war office, the stationery

office, and for all the other principal departments for which no solicitor is specially appointed.

SOLIDUNGULA. See *EQUIDÆ*.

SOLIDUS, the name by which the old Roman "aureus" (equivalent to five dollars according to the present value of gold) was known after the time of Alexander Severus; but during the reign of Constantine the great its value was diminished in the ratio of 8:5, and so remained till the end of the empire. The weight of these later solidi was fixed at $\frac{1}{8}$ of an ounce, the gold being 23 carats fine, and the alloy mostly native silver. The "solidus," or "solidus aureus," was adopted by the Franks under the Merovingians and Carolingians (at 87 to the Roman pound) till the time of Pepin, who suppressed it; but another solidus of silver, or "solidus argenteus"—the $\frac{1}{20}$ of the libra or pound—which had been used only as a money of account, was soon after made a coin. In after-times, this "sol," or "sou," like all other coins, underwent an infinity of variations in fineness and value (see *LIVRE*). On the introduction of the decimal system (1793) into France, the sou was abolished, and a piece of 5 centimes ($\frac{1}{20}$ of a franc) substituted, but the name continued in common use, and the old sous were retained in circulation. The solidus also appears in the *soldo*, which was a coin in use in northern and central Italy, and was essentially the same with the sou.

SOLINGEN, a t. of Prussia, province of the Rhine, and government of Düsseldorf, capital of a circle of the same name, is situated on a height, 18 m. n.n.e. of Cologne, and not far from the river Wupper. It is a very old place, and has long been famous for its steel and iron ware manufactures, especially sword-blades, helmets, cuirasses, knives, and scissors, which are exported to all parts of the world, and rival the excellence of English wares. Solingen hand-bells have been famous since the middle ages, and are sent to the most distant lands. Pop. '95, 40,843.

SOLIS Y RIBADENEYRA, ANTONIO DE, 1610-86; b. Spain; entered holy orders in 1667. He wrote several plays, of which *La Gitanilla*, "The Little Gipsy Girl," is the best known. His historical writings are of more importance, especially his *Historia de la Conquista de México* (1684), which was translated into English by Townsend, 1724. He was long royal historiographer.

SOLIS, JUAN DIAZ DE, about 1470-1516, b. Spain. He accompanied Pinzon in his explorations, and in his company discovered Yucatan in 1506. Shortly afterward they explored the South American coast from cape St. Augustine to lat. 40° south. After their return to Spain, 1509, a quarrel between them resulted in the imprisonment of Solis, while Pinzon was in court favor. He was released, indemnified, and in 1515 made further explorations from cape San Roque to Rio de Janeiro, and discovered the La Plata. He was killed by the Indians.

SOLITAIRE, *Pezophaps*, a genus of birds of the Dodo (q.v.) family (*Didinæ*), but differing from the dodos in a smaller bill and longer legs. Like the dodos, the only species of this genus, of the existence of which there is any evidence (*P. solitaria*), seems to be now extinct, and to have become extinct in very recent times. It inhabited the island of Rodriguez, an island about 15 m. long by 6 broad, situated about 300 m. to the e. of Mauritius, and appears to have been peculiar to that small and lonely island, where it was abundant at the beginning of the 18th century. Rodriguez was uninhabited till 1691, when a colony of French Protestant refugees settled on it, under the command of François Leguat, who, in his *Voyages et Aventures*, has left an interesting and trustworthy account of the solitaire. He describes it as a large bird, the males sometimes weighing 45 lbs.; taller than a turkey, the neck a little longer in proportion, and carried erect; the head of the male without comb or crest, that of the female with something like a widow's peak above the bill; the wings small, and the bird incapable of flying, but only using the wings to flap itself or to flutter when calling for its mate, or as a weapon of offense or defense; the bone of the wing being thickened at the extremity so as to form a round mass, about the size of a musket-bullet, under the feathers, and to increase the force of the blow given by it; a roundish mass of feathers instead of a tail. He further describes the plumage as very full and beautiful, not a feather out of its place, so there can have been no feathers with unconnected webs, as in the ostrich. He says the bird is called solitaire because it is very seldom seen in flocks. He tells us that the bird is with difficulty caught in the forests, but easily on open ground, because it can be outrun by a man; and that its flesh is very good to eat.—But the solitaire seems to have completely disappeared from Rodriguez, which is now a British settlement. Bones have been lately found in large quantities, and since Prof. Newton's visit to Rodriguez in 1865, the skeleton has been entirely reconstructed, and skeletons are preserved in the South Kensington museum, in the Royal college of surgeons, and in the Museum of the university of Cambridge.

The name solitaire was originally given to a species of dodo inhabiting Bourbon, also extinct, of which the remains have never been found, and was applied by Leguat to this bird, in a mistaken belief of its being the same. See *Strickland and Melville on the Dodo and its Kindred*.

SOLITAIRE, a species of game or rather puzzle, which, as the name denotes, is played by only one person. The apparatus for the game consists of a round or octagonal flat board, indented with 33 or 37 hemispherical hollows, and 33 or 37 balls, one in each hollow. The process of the game consists in removing one ball from the board, and then, having created a vacancy, capturing one of the balls adjoining by causing the one behind to leap over it into the vacant hollow; there are now two vacancies, and the game is continued in the same manner by capturing ball after ball, till only one remains, when the game is *won*. Should more than one be left, and they be so isolated as not to be liable to capture by each other, the game is *lost*. This puzzle may be solved in an immense number of ways; one of the prettiest modes consists in removing the central ball, and so capturing the others that the last ball shall be in the center.

SOLLER, a small town and seaport of the Balearic isles, in Majorca, 13 m. n.e. of Palma. It exports oranges and wine, and contained '87, 7988 inhabitants.

SOLMIZATION. See SOLFEGGIO.

SOLO, a term used in musical compositions of several parts, whether vocal or instrumental, to indicate those voices or instruments that are to perform alone or in a more prominent manner, as *soprano solo*, *violino solo*. The plural *solis*, is used when two or more voices or instrumental parts are to be performed together, such parts, of course, never being double.—A composition for a single instrument accompanied is also termed a solo.

SOLO'FRA, a small city of southern Italy, province of Avellino. Pop. '81, 3864. It is situated on the Apennines, and is surrounded by wooded mountains.

SOLOMON (Hebr. Shēlōmō, Salomon, Suleimān, derived from *shalon*, peace = peaceful, like Germ. Friedrich), the second son of David and Bathsheba; successor of the former on the throne of the Israelitish empire for 40 years (1015-975 B.C.*). Nothing is known of his youth except that he was probably educated by Nathan (or Jehiel). Equally uncertain is the age at which he succeeded to the crown of his father. That he was older than 12 or 14 years, as some traditions tell us, seems certain. The way in which his succession to the throne during the lifetime of his father was brought about, to the exclusion of his elder brother Adonijah, is not undeserving of the name of *coup d'état*, which has been bestowed upon it (see the Scripture narrative). Having, by the execution of Adonijah and the leaders of his faction, secured his dominion against internal foes, he, with complete disregard of the Mosaic law, set himself to seek foreign alliances, and with this view married as his principal wife the daughter of Pharaoh, probably of Psusenes (Vaphres?), of the twenty-first dynasty. Besides her, however, he had a vast number of wives—700 “princesses,” and 300 “concubines”—the greatest part of whom were recruited from nations with whom an alliance had been strictly prohibited. Having inherited fabulous wealth, and further adding to it enormously from his own multifarious revenues, so that “silver was nothing accounted of in his days,” it became necessary that a new organization corresponding to this unheard-of splendor should be introduced. Accordingly, we hear of “princes,” i. e., great officers of state, not before heard of. The two counselors of David's time disappear, in order probably to make room for a whole body of legal advisers; the prophets are no longer to be found among the dignitaries of state, but new military charges are created instead. The immense accumulation of treasure also allowed the execution of a number of public works in Jerusalem, which now first assumed the magnificence and station of a capital. A new wall with fortified towers was erected around it; and the queen's palace—“the house of the forest of Lebanon”—with a long hall joined to it by a cedar porch, called the “tower of David,” outside of which a thousand golden shields were suspended, and within which the king sat, in all his imperial splendor, to pass judgment, were built under his immediate orders. His banquets, at which all the vessels were of gold; his tables, with their four (or forty) thousand stalls; his gardens and parks and summer retreats, were such as to dazzle even eastern fancy. Twelve commissaries, distributed in the different provinces, had each in his turn to furnish the means of sustaining this prodigious household. The dominion of Solomon extended from Thapsacus, on the Euphrates, to Gaza on the Mediterranean. The country was in the profoundest state of peace; the treasures accumulated by David appeared inexhaustible; and the popularity of the king, who listened to the meanest of his subjects; and gave judgment according to that wisdom, for which he had asked in his vision at Gibeon, in preference to any other gift, and which has remained proverbial from his day to ours, was naturally at first very great. Everything, moreover, was done to develop and increase the national wealth and welfare. The rich internal resources were developed, and commercial relations of the most extensive nature established.

Through the port established at Ezion-Geber, at the head of the gulf of Elath, an outlet was gained to the Indian ocean; and the alliance with Phenicia, then under the sway of Hiram, gave an energetic impulse to these foreign expeditions. Manned with Tyrian sailors, the Israelite fleets went to “Ophir,” and brought back, in exchange for their own exportations, “gold and silver, apes and peacocks, ivory and spices;” and the

* There is some discrepancy among investigators about this date; the beginning of his reign being fixed variously at 1009, 1025, 990, etc.

rest of the strange and precious produce of India, Africa, Spain, and other regions, possibly even our own coasts.

According to his promise, Solomon, in the fourth year of his accession, commenced the building of the temple on Moriah, after the model of the tabernacle, wherein he was aided by Hiram, who not only sent him timber, but architects and cunning Phenician artists in wood and stone and metals. In the eleventh year of his reign it was completed, and solemnly inaugurated in the following year—at which occasion prodigious numbers of sacrifices were slaughtered. Thirteen years more having been spent in the construction of the “house of the forest of Lebanon” (the royal palace), other buildings and fortifications—among them that of Palmyra—are recorded to have been undertaken by the king, who, far from wishing further to extend his dominions, was only bent upon keeping his frontiers safe from the raids of the neighboring hordes, and for that purpose alone kept up an unprecedentedly large army.

The fame of Solomon could not but spread far and near. The splendor of his court and reign, heightened by his personal qualities, his wisdom and erudition—for he was not only the wisest but also the most learned of men—brought embassies from all parts to Jerusalem to witness his magnificence, and to lay gifts of tribute at his feet. The queen of Sheba's expedition and presents are well known; and as many Arab kings made him annual presents of a no less splendid nature, his income from different sources was calculated, in round numbers, at the enormous sum of 666 golden talents. That people of Moses, which was to know no other wealth than flocks and the fruits of the soil, had suddenly become a people of wealthy merchants, of soldiers, and of courtiers—and it did not profit by the change, chiefly through the bad influence of the king himself and his court. The army and the public buildings absorbed the resources of the provinces. In the Temple, erected for the purpose of the true worship of Jehovah, Solomon sacrificed three times a year; but nevertheless, to please his concubines, he allowed, and perhaps himself indulged in, the rites of polytheism on the heights, thereby setting the worst example to his subjects, sufficiently eager already to worship foreign deities. His exaggerated polygamy fostered immorality and licentiousness among the people; and, worst of all, the wise and gentle monarch, as his treasure got exhausted, began, toward the end of his reign, to lay the yoke, which hitherto had lain only on his Canaanite subjects, upon the Israelites themselves. And he thus became, to all intents and purposes, an eastern despot—selling part of his dominion to raise money, and trying to break the spirit of the nation by forced services and corporal chastisements.

Left by the “prophets,” probably since his open and revolting infidelity with regard to the national worship, his advisers were chiefly insolent young courtiers, who awed even his aged counselors into silence, and from that time forth a storm began to gather over the land. The priests were on the side of the malcontents, and a vague talk of a general rising, which actually found utterance by a “prophet” in the face of Solomon, was heard throughout the country. Ahijah of Shiloh predicted, as Samuel had done to David, the partial dominion to the Ephraimite Jeroboam, who had to flee for his life to Egypt. But notwithstanding these internal mutterings, and the open revolts of one or two subject chiefs, such was the prestige both of David's and Solomon's name, that the king was allowed to die in peace.

Solomon has been supposed to be the author of Canticles (q.v.), Ecclesiastes (q.v.), Proverbs (q.v.), besides works on science which are said to be lost. But he is also to be considered the prime cause of the final and decisive downfall of the Jewish commonwealth for all historical times. His wisdom turned into folly, his justice into tyranny, raised a smoldering discontent which only awaited his death to break out into open flames of revolt and internal wars. His character presents the lamentable spectacle of genius gone astray; and many have been the discussions on the part of learned theologians in old and late times as to whether or not there was any hope of his “salvation.” His name and his glory, however, will, notwithstanding the shadows that fall over his latter days, remain immortal, whether we look at the striking picture of him given in Scripture, or to the more gorgeous kaleidoscope of eastern legends revolving round the golden name of Suleiman: the lord and master of all animate and inanimate beings under the sun, the most beautiful, the most wealthy of all created men, and whose wisdom was as much without limits as were his riches and power.—See for such legendary accounts of Solomon, Weil's *Biblical Legends*, the *Targums*, the *Koran*, Lane's *Arabian Nights*, D'Herbelot, Ginsburg, Furst's *Pertenschnure Suleiman-Nameh* in 70 books, ascribed to a Turkish poet, Firdusi, etc.

SOLOMON BEN GABIROL. See AVICEBRON.

SOLOMON BEN ISAAC. See RASHI.

SOLOMON ISLANDS, a chain of islands in the Malay or Indian Archipelago, between New Britain on the n.w. and the Queen Charlotte islands on the s.e.; lat. 4° 50'—11° 50' south. Area estimated at 9000 sq. m.; pop. thought to be considerable, but not ascertained. The natives are partly Negrillos, partly Malays, and are still in the condition of savages. Earthquakes are frequent. The climate is unhealthy. There is a trade in copra and vegetable ivory in exchange for tobacco, fancy stuffs, beads, knives, etc. Part of the group belongs to England and part to Germany.

SOLOMON'S SEAL, *Polygonatum*, a genus of plants of the natural order *Utiaceæ*, differing from lily of the valley (q.v.) chiefly in the cylindrical tubular perianth, and in having the flowers jointed to their flower-stalks. There are three American species. The **COMMON SOLOMON'S SEAL** (*P. multiflorum*) is found in the woods and copses in many parts of England, and a few places in Scotland. It has a stem about two feet high, the upper part of which bears a number of large, ovate-elliptical, alternate leaves in two rows. The flower-stalks are generally branched; the flowers not large, white, and drooping.—The **NARROW-LEAVED SOLOMON'S SEAL** (*P. verticillatum*) is a rare British plant, only found in a few places in Scotland. The leaves are whorled.—The **ANGULAR, or SWEET-SMELLING SOLOMON'S SEAL** (*P. officinale*) is also rare in Britain, and is found only in England. It more nearly resembles the Common Solomon's Seal, but is smaller, and has greenish, fragrant flowers. These two species are common in many parts of Europe. They are very similar in their properties. The young shoots of *P. officinale* are eaten by the Turks like asparagus. The root is white, fleshy, inodorous, with a sweetish, mucilaginous, acrid taste. It contains *Asparagin*. It is a popular application to bruises, to prevent or remove discoloration, and its use is well known to those who are too apt to get a black eye now and then. A kind of bread has been made of it in times of scarcity. The berries are emetic and purgative.

SOLOMON'S SONG. See CANTICLES.

SOLON, the most famous of all the ancient Greek lawgivers, was a native of Athens (b. about 638 B.C.), and belonged to one of the most distinguished families of Attica. His father, Exceestides, having seriously impaired his income by improvidence, Solon was obliged, while still young, to embark in trade. At first, however, Solon comes before us as an amatory poet. His earliest appearance in the field of politics was occasioned by the contest between Athens and Megara for the possession of Salamis. By force of artifice, Solon revived the martial spirit of his countrymen, which had sunk under the effect of repeated disasters, obtained command of a body of volunteers, and conquered the island (*circa* 596 B.C.), in which, along with others, he obtained a grant of land. Henceforth his public career is conspicuously noble and honorable. He figures as a wise and unselfish patriot, seeking earnestly, and not in vain, to compose the distractions, partly social and partly political, that rent his native city. The Athenians generally had thorough confidence in his integrity; and in 594 B.C. he was chosen archon or chief magistrate, and received unlimited permission to act as he saw best for the good of the state. In short, to borrow a phrase from Roman history, he was invested with dictatorial power. The nature and extent of the Solonian legislation has been the subject of much criticism in modern times, and Mr. Grote, in particular, has made it very clear that the "later ancients" (Plutarch and Diogenes Laërtius), on whom we are obliged to rely for almost all our information about Solon, are full of confusions, misapprehensions, and contradictions, and that it became a habit among them to mythically attribute to the great Athenian every bit of wise legislation whose paternity they could not discover.

In order to alleviate the wretchedness arising from the existing relations of debtor and creditor, which was no longer supportable, and was likely to create a social war, Solon proposed and carried a notable measure—the *seisachtheia*, or "disburdening ordinance" (from *seio*, to "shake off," and *achthos*, a "burden")—which received its name from its design—viz., to lighten the burden of debt that weighed down the *thetes*, or lower classes. How this was effected, is far from being correctly explained by Plutarch, and the reader who wishes to have the most rational solution of the matter must consult Grote's *History of Greece* (vol. iii.). From redressing the grievances of a class, Solon proceeded, at the solicitations of his countrymen, to remodel the constitution; and here, too, the qualities that are popularly associated with his name shine out conspicuously. Abandoning the semi-civilized theory which regards the nobles as alone worthy of citizenship, and of the honors of public office in the state, he introduced the timocratic, or rather the plutocratic principle—classifying citizens according to their wealth or property; the effect of which was not to wrest *all* power or dignity from the hands of the *eupatridæ*, or well-born class, but only to give a portion of it to others who might be as wealthy, and therefore, presumably, as intelligent and cultivated as they. Such a reform has been compared to that previously effected by Servius Tullius in the constitution of ancient Rome; and there is at least a striking resemblance in the method, if not in the design, of the two reforms. See **ROME**. Solon distributed the citizens into four classes. The first embraced all those whose yearly income reached 500 medimni; the second, those of between 300 and 500 medimni; the third, those of between 200 and 300 medimni, and the fourth, those whose income fell below 200 medimni. The first three classes were liable to *direct* taxation; the fourth not; but all were liable to *indirect* taxation. With regard to the *boule*, or deliberative assembly of four hundred, it would seem that Solon left it the strictly aristocratical body that he found it. Its power, however, was practically limited by a new *ecclesia*, or assembly of the four classes, whose ratification was necessary to all measures originating in the *boule*, or "upper house." On the other hand, the *ecclesia* itself could originate nothing, and thus the attic aristocracy and the attic plebs could mutually check each other's assumptions. The part of Solon's legislation relating to the industrial pursuits of the citizens appears to have been as

excellent and well considered as the rest, but the number of his special enactments is so great that we cannot afford space to mention them. It is enough to state that they embraced almost every subject of social importance; and the best testimony to their value lies in the fact, that when Peisistratos violently overthrew the political constitution established by his kinsman, he allowed his social legislation to stand. See *PEISTRATOS*.

The story of Solon's leaving Athens for ten years, after he had completed his labors as a lawgiver, and traveling into foreign countries, may be, and probably is historical, but the details are untrustworthy; and in particular, the celebrated incident of his interview with Cræsus will not suit the requirements of chronology, and must be relegated to the domain of historic myths. During his absence, the old dissensions among the Athenians broke out, and when he returned, Solon struggled in vain to repress them. A strong hand, as well as a wise head, was needed, and the conspiracy of Peisistratos was quite as much one against anarchy as against the constitution. After Solon's defeat, he withdrew into private life, but occasionally assisted with his advice his bold, ambitious, and able kinsman, who had so effectively crushed the Athenian "disorderlies" of all parties. The date of his death is uncertain.

SOLOR' ISLANDS, THE, lie e. of Flores, between $122^{\circ} 56' 30''$ — $124^{\circ} 25'$ e. long., and belong to the Netherlands residency of Timor. Besides several groups of smaller islands, they consist of Solor, with an area of 105 sq. m., and a pop. of 15,000; Adanara, Lomblem, and Pantar. Solor and Adanara are separated from Flores by narrow straits; Lomblem and Pantar lie in succession further east. Area of the group, 1250 sq. m.; pop. estimated at from 40,000 to 180,000.

Solor has little cultivated land, the natives being good sailors, and chiefly employed in fishing. Much sulphur and saltpeter are found, from which gun-powder is made. The women weave coarse fabrics for clothing, and exotic cotton has lately been planted with success. Edible nests are extensively collected. In all the villages on the coast, markets are stately held, and numerous frequented. The natives near the sea are Malays, friendly to the Dutch, a few of them Christians, the others Mohammedans. Those of the interior are Alfours, wild and warlike, who use shield and bow, sword and fire-arms. Adanara is governed by an independent rajah. It is a lovely island, having hills and dales, picturesque villages, and cultivated fields. The people are Malays, partly Mohammedans and partly Roman Catholics. Lomblem is also beautiful, the natives Malays; those of Pantar being Papuans.

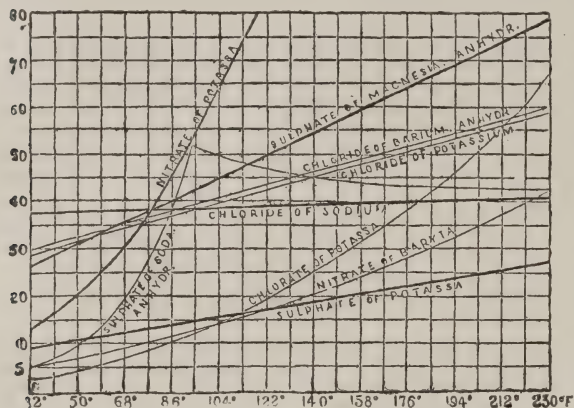
The Solor islands are mountainous; the volcano Lobetolle, in Lomblem, is 4,914 ft. high; and the mountains of Pantar, 3,332. They are clothed to their summits with forests. In 1851 the Portuguese relinquished all claim to these islands, which are now governed by the military commander at Larantooka, in the e. of Flores; a Dutch post-holder being stationed at Lawajang, the chief place of Solor.

SOLSTICE (Lat. *solstitium*, from *sol*, sun, and *sto*, I stand), that point in the ecliptic at which the sun is furthest removed from the equator, and where he is consequently at the turning-point of his apparent course. There are two such points in the ecliptic, one where it touches the tropic of Cancer, the other where it touches that of Capricorn. The former is the summer, and the latter is the winter solstice to those who inhabit northern latitudes, and *vice versâ*.—The term is also employed to signify the time at which the sun attains these two points in its orbit, viz., June 21 and Dec. 21.

SOLT, a t. of Hungary, county of Pesth, 48 m. s. of Pesth, in a marshy district on a branch of the Danube. Pop. '90, 6502.

SOLUTION. A substance is said to undergo solution, or to become dissolved, when the force of adhesion between it and a liquid in which it is immersed is sufficient to overcome the force of cohesion between the solid particles. Thus sugar or salt is dissolved by water, camphor, or resin by spirit of wine, and silver by mercury. The liquid which effects the solution is termed the *solvent*, or sometimes the *menstruum*; and some solutions have special names—for example, the term *syrup* is applied to a solution of sugar in water, and *tincture* to a solution of a solid in alcohol. If a solid body be introduced in successive small portions into a definite quantity of a liquid capable of dissolving it, the first portions disappear the most rapidly, and each successive portion dissolves more slowly than its predecessor, until a point is reached at which the liquid ceases to possess any further solvent power. When this occurs the forces of cohesion and adhesion are balanced, and the liquid is said to be *saturated*. Solution is promoted by increasing the extent of surface in a solid, or by reducing it to powder. An elevation of temperature, by diminishing cohesion, will generally also increase the solvent power of the liquid; but there are exceptions to this rule—as for instance, in the case of lime and its salts, water just above the freezing-point dissolving nearly twice as much lime as it does when boiling. A compound of lime and sugar, very soluble in cold water, is separated from the solution almost completely if heated to boiling. But the most remarkable case of the kind occurs in sulphate of soda (Glauber's salt), which in its crystalline form dissolves in about ten times its weight of ice-cold water, and rapidly becomes more soluble as the temperature rises until it reaches 91° ; from this point until the solution boils the solubility slightly decreases, the boiling liquid only retaining about four-fifths of the quantity which was dissolved at 91° . Carbonate and seleniate of soda, and sulphate of iron,

exhibit the same peculiarity in a less marked degree. "These anomalous results may be partly explained," says Dr. Miller, "by the consideration that heat diminishes the force of adhesion as well as that of cohesion. Generally speaking, cohesion is the more rapidly diminished of the two, although not uniformly so; and in these cases it would appear that the adhesive force decreases in a greater ratio than the cohesion of the saline particles" (*Chemical Physics*, 3d ed. 1863, p. 72). The accompanying diagram shows the



unequal solubility of various of the more common salts in water of different temperatures. The lines of solubility cut the verticals raised from points indicating the temperature upon the lower horizontal line, at heights proportional to the quantities of salt dissolved by 100 parts of water. For example, 100 parts of water dissolve—at 32°, 8 parts, at 122°, 17 parts, and at 212°, 26 parts of sulphate of potash. Water which has been saturated with one substance—that is, which refuses to dissolve any more of that substance, will often continue to dissolve others.

In true or simple solution the properties, both of the solid and the solvent, are retained. When, however, any chemical action ensues between the solid and the liquid, the resulting solution commonly presents perfectly new and distinct features; as, for example, when the metals are dissolved by acids, or oils by the alkalies (as in soap-making). For the solubility of the gases in water we must refer to the article GASES.

The uses of solution in laboratory processes are numerous. By the difference in degree of their solubility we can separate one substance from another; and by dissolving a body we can purify it, either by filtration or crystallization. Moreover, when it is required that two bodies shall react on one another, they do so with incomparably more force in their dissolved than in their solid state.

SOLVENT. See SOLUTION.

SOLWAY FIRTH—in its upper part best regarded as the estuary of the river Esk; in its lower, as an inlet of the Irish sea—separates the n.w. of Cumberland from the s. of Scotland. Its entire length, until lost in the Irish sea, is calculated at 33 m.; its average breadth for the first 12 of these is not more than 2½ m., but afterwards it gradually, although irregularly, increases to upward of 20. The principal rivers flowing into it, besides the Esk, are the Annan, Nith, Dee, and Urr, from the n. or Scottish side; and the Eden and Derwent from the s. or English side. The spring-tides are peculiarly swift and strong—the wave rushing in from 3 to 6 ft. high, and at the rate of 8 to 10 m. an hour, occasionally inflicting serious damage on the shipping; while after it has retreated, great stretches of the bed of the firth are left bare, and in some places one can even cross over from the English to the Scottish shore. The salmon fisheries of the Solway are valuable.

SOLWAY MOSS is a district of Cumberland, about 7 m. in circumference, lying w. of Longtown, and immediately adjoining Scotland. As its name implies, it was once a bog, but is now drained and cultivated. It is historically notable as the scene of a battle between the English and Scots in 1542, when the latter were defeated. Here also, on Nov. 13, 1771, an extraordinary disaster occurred. The boggy ground, surcharged with moisture—the effect of heavy rains—rose, swelled, and burst like a torrent, sweeping along with it trees and houses, and destroying some 30 small villages.

SOLYMAN (SULEIMAN) II., surnamed "THE MAGNIFICENT," the greatest of the Turkish sultans, was b. in 1490; and in Sept., 1520, succeeded his father, Selim I. (q.v.), who had carefully initiated him into the secrets of Ottoman policy. At the commencement of his reign, he restored a large amount of unjustly confiscated property, and removed from office all who were unfit for the proper discharge of their duties. After having suppressed the revolt of the governor of Syria, he exterminated the Egyptian Mamelukes, and concluded a treaty with Persia. The foolish insolence of the Hungarian court next drew him thither with a powerful army, and Belgrade, the key of that country, was captured (1521). He next drove the knights of St. John from Rhodes (1522); and for 3 years following devoted himself to improvements in the administration; but his attempts at military reform provoked a rebellion of the janizaries, which he saw no other means of quelling than by engaging them in a war with Hungary. He gained the

signal victory of Mohacz (1526), and continuing his resistless course, took Buda and Pesth; but he was recalled by the news of a rebellion in the e., and retreated down the Danube to Constantinople, committing frightful ravages on the way. In 1529 he was summoned to Hungary in aid of his protégé, king John Zapolya, who was contesting the crown with Ferdinand, and accordingly invaded that country with a mighty army, capturing and destroying as he went, and laid siege to Vienna, but after various unsuccessful assaults, he was compelled to retreat. Two years afterward (1531), he again appeared in Hungary; but his progress this time was checked by Charles V. in person, who had come with the imperial army of 250,000, in aid of his brother. In 1535 he concluded with Francis I. the famous treaty which opened the commerce of the Levant to the French flag alone. In 1540 the long and desultory contest between the Turks and Imperialists for Hungary was ended in favor of the former, who took complete possession of the country. After this, the alliance between the French and the Turks began to bear fruit; the combined fleets ravaged the Italian coasts, and pillaged Nice (1542); but peace was again restored with Germany in 1547. The Turks were now supreme in the Mediterranean; Gozzo and Tripoli fell into their hands, and the conquest of the Banat of Temeswar (1551) assured them a firm hold over Hungary. A second and third war with Persia, which was now in a state of semi-subjugation, the bloodthirsty ambition of his favorite wife Roxolana, who succeeded in persuading him to put to death the children of his other wives, a brilliant naval victory (1561) over the knights of Malta and their allies the Spaniards, an unsuccessful blockade of Valetta in Malta (1565), and a fresh expedition to Hungary (1566), were the chief events of the remainder of his reign. During this last expedition, while besieging the little town of Szigeth or Szegedin, which resisted all his attacks, he died on Sept. 5, 1566.

SOMA ("the moon-plant," or *asclepias acida*) is, in the Vedic hymns, the god who represents this plant, and one of the most popular deities of the Vedic religion. The reason for this popularity must be sought for in the important part which the juice of the Soma-plant played in the great Vedic sacrifices, and probably also in its alcoholic and invigorating properties, which the sacrificer experienced when he drunk of it in the exercise of his functions. These properties are constantly described or alluded to in the hymns addressed to Soma. Thus, in some hymns, Soma is said to exhilarate Varoun'a, Mitra, Indra, and the other gods who partake of its juice; and in another, the worshippers exclaim: "We have drunk the Soma; we have become immortal; we have entered into light; we have known the gods. What can an enemy now do to us, or what can the malice of any mortal effect?" In other passages, the juice of the Soma is said to be a draught of immortality, medicine for the sick, and a remedy for blindness and lameness. Thus Soma became endowed with supernatural qualities and divine attributes, and gradually was exalted as one of the most powerful deities. He is the friend, helper, and soul of Indra; he is the slayer of the cloud-demon Vrîtra, the destroyer of foes, the dispeller of darkness, the creator of the sun, the upholder of the sky, and the sustainer of the earth, the king of gods and men; he is thousand-eyed, the most heroic of heroes; he is wise, strong, energetic, etc. See the interesting article on Soma by John Muir, in his "Contributions to a Knowledge of the Vedic Theogony and Mythology," in the *Journal of the Royal Asiatic Society*, new series, vol. i. pp. 135, ff. In the classical period of Hinduism, Soma ceases to be worshiped in the character which he has at the Vedic period; he then becomes the god of the moon. This transition from Soma, the plant and its juice, to Soma, the moon, which is perceptible even as early as in the S'atapatha Brâhmana of the White Yajurveda (see VEDA), is apparently due to the belief, that *Amrîta*, the beverage of immortality, was guarded by the moon, and to the circumstance that, in the Vedic hymns, Soma is frequently called or described as *Amrîta*. The myths connected with Soma, the moon, are wholly different from those relating to the Vedic Soma. As moon, Soma was born from the eyes of Atri, a son of Brahman, the first god of the Trimûrti (q.v.); and became installed by Brahman as the sovereign of plants, Brâhman'as, and planets. But after he had acquired extensive dominion, he became arrogant and licentious, and carried off Târâ (lit., a star), the wife of Vrîhaspati, the preceptor of the gods. Vrîhaspati seeking to recover his bride, and some of the gods siding with him, and others with Soma, a war broke out, which ended in Târâ's being restored to her husband. The result, however, of her stay with Soma was the birth of a son named Budha, who became the ancestor of a dynasty of kings, called the lunar dynasty. See SÛRYA.

SOMALI LAND, or SOMAULI, an extensive maritime country in the e. of Africa, is triangular in shape, and is bounded on the n. by the gulf of Aden, on the s.e. by the Indian ocean, and on the s.w. by the Jub river. From the middle course of the Jub to cape Guardafui, which forms the apex of the triangle, the distance is nearly nine hundred miles. The area of the country is estimated at 330,000 sq.m.; but as great part of its interior still remains unexplored, the number of its inhabitants has not been ascertained. An agreement was concluded in 1894 between the English and Italian governments, which gave definite limitations to their provinces. The Jub, which forms the s.w. boundary, is a large fertilizing stream, drawing its waters from the mountains of southern Abyssinia, and flowing s.e. between the territories of the Gallas on the w. and those of the Somali on the e., to its mouth on the northern frontier of Zanzibar.

The present Somali race were originally Arabs, who landed on the African shore s. of the gulf of Aden early in the 15th century. Driving back the earlier inhabitants of the country, who were Christians, the Moslem made themselves masters of the country. The inhabitants are extremely violent and quarrelsome in their disposition, are notorious for cheating and lying, and for the most part pursue a wandering, pastoral life. The chief trading place is Berbera, on the n. coast; and the products of the country are sheep, cows, ghee, grass-made mats, ostrich feathers, and hides. These are exchanged at the ports for cloth, dates, rice, beads, and iron. Berbera and the north coast became Egyptian in 1875. See *illus.*, ZANZIBAR, ETC., vol. XV.

SOMATOLOGY. See MATTER; ATOM; ATOMIC THEORY; FORCE (CONSERVATION OF); PERCEPTION.

SOMBRERERE TÉ, a t. of Mexico, in the state of Zacatecas, and 100 m. n.w. from Zacatecas, in a mountainous district celebrated for its rich silver mines from which Sombrerete derives all its importance. Pop. '92, 7900.

SOMERS, JOHN, Lord, 1652-1716; b. Worcester, England; graduated at Trinity college, Oxford; became a lawyer, 1676, pursuing at Oxford classical, historical, and judicial studies; commenced practice at London, 1682, and became a leader of the whigs; of counsel for the seven bishops, 1688; member of "Convention Parliament," and solicitor-general, 1689; attorney-general, 1692; keeper of the great seal, 1693; a lord justice, 1695; lord chancellor and raised to the peerage, 1697; removed from chancellorship, 1700, and arraigned for trial before the house of lords, but prosecution having been withdrawn, recovered his influence at court, and was chosen president of the Royal society, 1702; president of the council, 1708-10; and spent the remainder of his life in comparative retirement.

SOMERSET, a co. in w. Maine, adjoining Canada; drained by the Waloostock, Penobscot, and Kennebec rivers; traversed by branches of the Maine Central railroad; about 3664 sq. m.; pop. '90, 32,627 chiefly of American birth. The surface is in part hilly, and there are extensive forests from which much lumber is taken for export. Co. seat, Skowhegan.

SOMERSET, a co. in s.e. Maryland, bounded on the n. by the Wiscomico river, on the s.e. by the Pacomoke river, and on the w. by Chesapeake bay; crossed by the New York, Philadelphia, and Norfolk railroad; about 365 sq. m.; pop. '90, 24,155, with colored. The surface is level and heavily timbered. The soil is sandy. The principal productions are corn and oats. Co. seat, Princess Anne.

SOMERSET, a co. in central New Jersey, bordered by the Passaic on the n.e., and on the w. by Lamington river; crossed by the New York and Philadelphia, the Central New Jersey, and Lehigh Valley railroads, and by the Delaware and Raritan canal; drained by the Passaic and Millstone rivers, and by branches of the Raritan; 303 sq. m.; pop. '90, 28,311. The surface is partly hilly and the soil fertile; the principal products are wheat, corn, potatoes, oats, wool, flax, butter, and cattle. It has good water-power and contains manufactories of agricultural implements, castings, and pig-iron; also tanneries, distilleries, flour and saw-mills. Co. seat, Somerville.

SOMERSET, a co. in s.w. Pennsylvania, adjoining Maryland; drained by the Youghiogheny and Castleman rivers; traversed by the Baltimore and Ohio railroad; about 1106 sq. m.; pop. '90, 37,217, chiefly of American birth. The surface is hilly, but very fertile; flax, wheat, rye, potatoes, corn, butter, and maple sugar are staples; sheep grazing is extensively carried on. Iron ore, bituminous and cannel coal are found. Co. seat, Somersett.

SOMERSET HERALD. See HERALD.

SOMERSET HOUSE, in the Strand, London, stands on the site of a palace built by the protector Somerset about 1549, which fell to the crown on Somerset's execution. The original Somerset House was pulled down and rebuilt in 1776, after designs by sir William Chambers, in the Palladian style for public offices. Various offices connected with the navy and other public departments were removed there in 1788; and in 1813 the east wing was completed to form King's college.

SOMERSETSHIRE, a maritime co. in the s.w. of England, is bounded on the n.w. by the Bristol channel, and in other directions by Devonshire, Dorsetshire, Wilts, and Gloucestershire. Area, 1,043,485 acres. Pop. '91, 484,337. Its form is oblong, its length being about 80 m., and breadth about 36. The surface is extremely diversified, there being every variation, from lofty hills and barren moors to rich vales and marshy "levels," many thousands of acres of the latter being below high-water mark, and depending for security on sea banks and sluices. The hills are divided into several ranges running from e. to west. One range, known as the Mendips (q.v.), runs from near the city of Wells to the coast at Brea-down. South of these hills is a vast marshy plain, on which the Polden hills stand out abruptly like an island. Another conspicuous group, called the Quantocks, rise near Taunton and attain a maximum elevation of 1262 feet. And finally, in the extreme w., is the wild district of Exmoor forest, composed almost entirely of barren hills, the highest of which, Dunkery beacon, is 1709 ft. above the sea level. The rivers of the county rise chiefly in these high grounds, and

are none of them of any magnitude except the Bristol Avon, which rises in Wiltshire, and for some miles divides Somersetshire from Gloucestershire. The Paret drains the middle districts and is a tidal stream up to Bridgwater, presenting at spring-tides the peculiar phenomenon called the "bore." The soil is mostly fertile, and the pasture-lands are almost unrivaled for their luxuriance. The wheat and barley grown around Bridgwater are famous; but grazing and dairy farming form the great objects of husbandry, and the cheese of Cheddar has a great reputation. Cider is also produced in enormous quantities, but owing to the prevalence of small farms agriculture is in a backward state. The hilly districts are rich in minerals, especially iron, with some lead and freestone; and the Radstock and Bedminster coal-fields supply the northern districts with excellent fuel. Oolite is largely developed in the neighborhood of Bath, where a beautiful building stone is extensively produced. The principal manufactures are woollen cloth, coarse linens, lace, silk, and gloves; and there are a number of potteries and breweries, and some printing works. The medicinal springs are an important feature of the county, having been the means of bringing into celebrity and sustaining the splendor of Bath (q.v.). Weston-super-Mare, containing at the beginning of the century a few hovels, is now one of the finest watering-places on the western coast. The parliamentary boroughs are Bath and Taunton; the cities are Bath and Wells; and besides these there are four other towns, Bridgwater, Chard, Glastonbury, and Yeovil, which are municipal boroughs. In ancient times this part of the kingdom was inhabited by the *Belgae*, and the Mendips appear to have formed so strong a barrier against the Roman and Saxon that even to this day philologists can trace the strong Celtic element that held its ground here. British camps are very numerous on the hills, and extensive remains of stone circles are visible at Stanton Drew, near Bristol. In Saxon times Somersetshire was one of the earliest counties to embrace Christianity; and, while a church was founded at Wells in 704 on the site now occupied by the fine cathedral, a monastery was founded at Glastonbury, which eventually became one of the wealthiest in the kingdom. Somersetshire was the principal arena of the rebellion of the duke of Monmouth in 1685.

SOMERS ISLANDS. See BERMUDAS.

SOMERSWORTH, a city in Stafford co., N. H.; on Salmon Falls river, and the Boston and Maine railroad; 74 miles n. of Boston. It was incorporated as a parish in 1729 and as a town in 1754 and was chartered as a city in 1893. It has a high school, a manufacturers' and village library, electric lights, electric street railroads, waterworks supplied from the river, national and state banks, weekly newspaper, and saw mills, cotton and woollen mills, and shoe factories. Pop. '90, of the town, 6207.

SOMERVILLE, a city in Middlesex co., Mass.; on the Mystic river and the Fitchburg and branches of the Boston and Maine railroads; adjoining the cities of Boston, Cambridge, Everett, and Medford. It was incorporated as a town in 1842 and chartered as a city in 1872, and contains nearly a dozen villages. There are English and Latin high schools, public library, hospital, Home of the Little Sisters of the Poor, Broadway, Central Hill, and Nathan Tufts parks, electric lights, and street railroads, water supply from the metropolitan system of Boston, and national, savings, and co-operative banks. The principal industrial plants are extensive slaughtering and meat-packing establishments, tube works, tanneries, flour mills, iron foundries, and desk factories. Pop. '90, 40,152.

SOMERVILLE, Mrs. MARY, a lady famed for her mastery of mathematics and physical science, was the daughter of admiral sir William Fairfax. She was b. at Jedburgh on Dec. 26, 1780, and brought up at Burntisland, amid somewhat narrow family circumstances. Her mother taught her to read; but besides this, she had no education till she was nine years old. At ten, she went for a year to a school at Musselburgh; and on her return, took more delight in reading whatever came in her way than in sewing, to the great discomfort of her relatives. After she was thirteen, she twice had, during a sojourn in Edinburgh, an opportunity of attending classes, studying music, drawing, and a little Latin, and of mixing with Edinburgh society. It is somewhat singular that it was in an algebraic sum in a magazine of fashions that Mrs. Somerville first made her acquaintance with the subject that most engrossed her attention later in life. In 1804 she married Mr. Greig, a commissioner in the Russian navy, and removed to London. Although Mr. Greig did not prevent her from continuing her studies, he himself had no interest in science, and had the usual prejudices against learned women. It was not till her return north as a widow, after three years of married life, that she was free to buy the books she wanted, and to study the subject that most interested her. She was now 33 years old, with two children. In 1812 she married her cousin, Dr. William Somerville, who entered warmly into all her ideas. Her husband and she removed to London in 1816, where Mrs. Somerville went much into society, and became known as possessed of scientific interests and gifts. In 1823 Mrs. Somerville was invited by lord Brougham to try to popularize, for the English public, Laplace's great work, the *Mécanique Céleste*. This she was persuaded to undertake, and published it as the *Celestial Mechanism of the Heavens*, in 1830. The work was received with the greatest admiration. Mrs. Somerville was awarded a royal pension in 1855. *The Connection of the Physical Sciences* was

published in 1835, and has passed through nine editions. Her next work was *Physical Geography* (1848), of which there have been six English editions. *Molecular and Microscopic Science* appeared in 1866. Mrs. Somerville, who for many years resided in Italy, died at Naples, Nov. 29, 1872, having maintained till the end the perfect use of her faculties. An autobiography, edited and supplemented by a daughter of Mrs. Somerville, was published in 1873.

SOMERVILLE, WILLIAM, 1677-1742, b. Warwickshire, England, of good family; educated at Oxford university. He afterwards resided on his ancestral estate as a country squire and wrote *The Chase and Field Sports*, both poems, and also fables and tales of some merit.

SOMMA VESUVIANA, a town in the province of Naples, Italy, 9 m. e. of Naples. Pop. '81, 8511.

SOMME (anc. *Samara*), a river of northern France, rises near Font-Somme, in the department of Aisne, and falls into the English channel midway between Boulogne and Dieppe. Its entire length is about 152 m.

SOMME, a maritime department in the north of France, s. of Pas-de-Calais, and n.e. of Seine-Inférieure. It has an area of 2379 sq. m., and a pop. '96, 543,279. Somme is for the most part quite level, and in some parts marshy. The department produces abundance of corn and garden-fruits; also beet-root, oil-yielding plants, and splendid carrots. The rearing of cattle is carried on to a great extent. The chief manufactures are velvets, chemicals, woollens, cottons, linens, silk, leather, and tapestries.

SOMNAMBULISM (Lat. sleep-walking). Walking in sleep is the most palpable, but not the most marvelous characteristic of this condition. The person affected walks, rides, climbs, with the eyes shut or insensible; his movements are precise, cautious, leading him into positions of difficulty and peril, which, if perfectly alive to their real nature, or if acting under the influence of ordinary motives, he would avoid; and yet there appears to be a partial consciousness of surrounding objects, and an adaptation to circumstances. Individuals have, while in this state, performed long journeys on foot or horseback, paying tolls, avoiding obstacles; they have successfully descended into coal-mines; they have ascended in safety to the roofs of houses, have climbed rocky cliffs, and successfully robbed eagles' nests, during the night; millers, saddlers, grooms, seamstresses, have all performed their customary work with perfect exactitude, but without any recollection of their exertions or industry. Notwithstanding the accuracy with which many acts are performed, that particular senses may be dormant is proved by insensibility to loud noises, and by a cook eating cabbage which had been substituted for a salad which he had carefully and artistically prepared. The senses, in relation to the idea or train of ideas present to the mind, appear to be awake, and preternaturally acute. This fact has suggested the hypothesis, that certain faculties are wakeful, open to impressions, and actuated by volition; while others, and the mind in general, are plunged in profound sleep and unconsciousness. This may be true, and is in harmony with the opinion, that the phenomena are an acted dream or delusion, and that what is seen, heard, or done, is the mere embodiment or repetition of former impressions or impulses, at the time before the mind. This may be illustrated by the case of the student narrated by the archbishop of Bordeaux, who composed a sermon and wrote out music while asleep; read them over, made corrections, scratched out lines, substituted others, put in its place a word that had been omitted, and continued to do all this, although a sheet of pasteboard was interposed between the writing and his face; showing that he was copying mental images, and not with the eye.

Somnambulism occurs in the sensitive and excitable, often in conjunction with other nervous affections, and is hereditary; so that it may be regarded as on, if not within, the boundary of disease.—Herbert Mayo, M.D., *On the Truths contained in Popular Superstitions*; Macnish, *Philosophy of Sleep*; Binns on *Sleep*.

SOMNAMBULISM, ARTIFICIAL. See HYPNOTISM.

SOMNAUTH, or **SOMNATH-PUTTEN**, a t. of Guzerat, in Hindustan, is situated on the s.w. coast of the peninsula of Kattywar (q.v.), about 33 m. from its southern extremity, and had in 1881 a pop. of 6644, most of whom were Mohammedans. The town is fortified by a strong stone wall 9 ft. thick, strengthened by 38 towers; it contains many mosques, and the ruins of the celebrated Hindu temple of the idol Somnauth. The ruins of the temple are in a state of fair preservation, and give the idea of its having been a gloomy, massive temple in the form of an oblong hall 96 ft. by 68 ft. crowned by a magnificent dome, and covered on the inside and outside with elaborate sculpture and carving illustrative of mythological subjects. The splendor of this temple has doubtless been much exaggerated by various travelers; but a thousand years ago it was so famous as a place of pilgrimage for pious Hindus, as well as for its immense wealth—the accumulations of centuries of presents—that it attracted the zealous idol destroyer, Mahmud of Ghizni, after he had accomplished his self-imposed mission of conquest, spoliation, and conversion in the rest of northern India. In 1024 he appeared before Somnauth drove its defenders—who at first had been buoyed up with sanguine hopes that their favorite god had drawn the Mohammedans hither that he might blast them with his wrath—to take refuge in the temple, where they defended themselves with such valor that Mahmud's army was forced to retreat; but the sub-

sequent rout of two Hindu armies which had advanced to the aid of the sacred city, so dispirited the defenders that Somnauth was immediately surrendered, the idol destroyed, and the enormous wealth of the temple, consisting chiefly of precious jewels, carried off along with the gates of the temple. These gates, which are said to have been made of sandal-wood, were brought back from the entrance to Mahmud's tomb in Afghanistan by the British in 1842, and their recovery announced in a magnificent proclamation, which called upon the chiefs of Sirhind, Rajputana, Malwa, Guzerat, to transmit them "with all honor" to the place whence, eight centuries ago, they had been violently removed. They were, however, never restored to Somnauth, as the home authorities disapproved of the tenor of the proclamation, fearing that it might stimulate religious animosity between the two great religious bodies of Hindustan. There was also reasonable ground of doubt as to whether the gates were really the original gates of Somnauth and even whether (since the *Ferishta* does not mention the circumstance) Mahmud had taken away any gates. The repute of Somnauth as a place of religious pilgrimage, and its wealth, revived some time after its spoliation by sultan Mahmud, to such an extent as frequently to attract the various Mohammedan robber-princes of western India; and it is still at the present day a chief resort of pious Hindus from all quarters, who pay a small tribute to the Guicowar for liberty to perform their devotions at this favorite shrine.— See Price's *Mohammedan History*, vol. ii.; Dow's translation of the *Ferishta*; Mirkhond's *Rauzat-al-safa*; sir John Malcolm's *History of Persia*, vol. i.; and Smith's *Life of Dr. John Wilson* (1878).

SONATA, a word supposed to be derived from the Italian *sonare*, to sound. It was first applied to a musical composition about the beginning of the 17th century, and as an antithesis to cantata, the musical work that was sung. The whole process of the development of the sonata as an art-form from its crudest beginnings to its highest culmination took nearly two hundred years. In its infancy it resembled the suite-form, and for a time was almost identical with it, but the sonata gravitated from pure dance-forms, which the suite embodied, and toward more complicated conditions. The different movements in a sonata came to represent different origins and types of music. The violin sonata attained first to perfection, since that instrument had so great an advantage over the early keyed instruments, and in it the slow introductory first movement generally shows traces of ecclesiastical influence; the second, an allegro, corresponding to the first movement of the modern sonata, was derived from the vocal madrigals, or part-music; the third, the characteristic slow movement, from solo vocal music, such arias from cantatas, or operas; and the last movement showed elements of dance-music, which was therefore a pure suite movement. In the first attempts to form an aggregate of distinct movements, the composers had to take their forms wherever they could find them. For a long while familiar dances held their place in the group of movements. The minuet survived the longest, but was ultimately supplanted by the Scherzo, and the Gigue and Chaconne, of which Bach left so many examples, was succeeded by the Finale, or Rondo. It is not known who first experimented in sonatas of distinct movements. The Italian names of Farina, Cesti, Frescobaldi, and Colonna, Rosenmüller among the Germans, and John Jenkins and Henry Purcell in England are among the first composers of the sonata. An awakening sense of the relation and balance of keys is seen in a set of seven sonatas for the clavier by Johann Kuhnau, called *Frische Clavier Früchte* (1703). Johann Mattheson chooses the Gigue as the concluding movement of his sonatas, and defines its form, and Alessandro Scarlatti (1659-1725) imparts a greater degree of unity. Albinoni, Alberti, Dr. Croft, Nicolo Porpora, Durante, and Domenico Scarlatti produced many original ideas. The works of Corelli are most valuable. He wrote 24 *Sonate da Chiesa* for strings, lute, and organ, 24 *Sonate da Camera* for the same, and 12 for the violin, violoncello, or cembalo. The domain of the sonata was long monopolized by writers for the violin, and advances were made by Locatelli, Geminiani, and Tartini until the sonata finally settled into the four-movement type. John Sebastian Bach wrote many sonatas for various instruments, and for combinations of instruments, some of which he described as sonatas, or suites, but he stands apart from the direct development of the sonata. With Haydn the structure of the sonata-form is established, although they are not especially interesting, owing to the meagre capabilities of the clavier of his day. He clearly marked the outlines, and made the use of the minuet and the rondo imperative. Mozart adds to Haydn's dry form, symmetry, grace, and more mature and elaborate themes and harmonies. Clementi and Dussek fill in the period between Mozart and Beethoven, who brought the sonata to its perfection. His early sonatas follow with new aspects Mozart's and Haydn's, but they gradually expand into works of enormous proportion. In such sonatas as the *Kreutzer*, for violin and pianoforte, and the pianoforte sonatas in D minor, op. 31; C major, op. 53; F minor, op. 57; B-flat, op. 106, and C minor, op. 111, he attains to such a command of technical resource and art expansion that his mastery seems almost superhuman. His sonatas regarded as a whole are the most valuable of all compositions for the pianoforte. A modern sonata is usually constructed on the following plan: the first movement, an allegro with two themes, each capable of varied treatment; the second, usually slow, in any time between Adagio and Andante; the third, a Minuet, or Scherzo; and the last a brilliant finale in the Rondo form. Schubert, Weber, Mendelssohn, Chopin, Liszt, Brahms, and Grieg have composed interesting and beautiful sonatas, but no composer has attained the height reached by Beethoven.

SONCHUS. See **SOW THISTLE**.

SONDERSHAUSEN, the capital of the principality of Schwarzburg-Sondershausen, pleasantly situated on the Wipper, 33 m. n.w. of Weimar. Pop. '95, 7013.

SONDRIO, a province in Lombardy, Italy; bounded by Switzerland on the n., Tyrol on the e., and Como, Brescia, and Bergamo on the s., drained by the Adda river; 1232 sq. m.; pop. '95 (est.), 134,624. The valleys of Valtellina, 45 m. long, and Chiavenna, form the greater part of the province. Some of the loftiest summits of the Rhetian Alps, are on the n. boundary, and include the celebrated passes of Splügen, Bernina, and Stelvio, the last being the highest, over which carriages pass. Excepting the marshes bordering lake Como, the soil is fertile, yielding fine crops of grain and fruit, particularly grapes, which are manufactured into wine. The Sondrio cheese is particularly fine. The province contains iron and marble. Capital, Sondrio.

SONG, a short poem intended for music, and a musical setting of a short poem or bit of prose. The term belongs to both music and poetry. The song may be divided into two classes, the artistic song written by poets and polished with conscious art, and the national, or popular song, such as the Volkslieder of Germany and the ballads of England. In some countries the development of the national song can be distinctly traced from the folk-song to the finished composition; in others, it remains clad in its primitive garb, for the song is that branch of music in which national peculiarities and local color linger the longest. The true song had no existence before the time of the Troubadours, in the 11th century, who gave it form with their graceful lyrics and rhythmical tunes. Their southern temperament and chivalry inspired the early songs with the theme of love. Satires, panegyrics, exhortations to the crusades, and religious odes were also written. Different songs had different names; in the *pastourelle* the poet would woo a shepherdess; the *alba* and *serena* were morning and evening songs; the *tensions* were dialogues of wit or gallantry; the *sercente*, an address from the lover to his mistress; the *canzo canzone*, the *soula*, a merry song; the *lai*, with its melancholy, the *carol* and the *ballata* all sprang from the Troubadours. A class of versifiers arose in southern France called Trouveres, and in Spain called Trobadores. Their system of notation was the same as that of the Troubadours, and the flame spread also to Italy, which had her Trovatori and Giocolini. But they wrote in the Provençal language until Dante proved the capacity of Italian. The development of the song in France was carried further by the *chansonniers* of the 13th century. Adam de la Halle (1240) wrote chansons for his *Robin et Marion*, which are similar in structure to those of the present day, and Guillaume Marchaud (1285) was renowned for his graceful balletes, or dance-songs, and numerous lais, virelais, ballades, and rondeaux. The influence of the church is distinctly felt in the 14th and 15th centuries, and many popular tunes were absorbed by it for themes for masses and motets. This use of secular music for ecclesiastical purposes is illustrated in the works of Clement Marot. Subsequently romances came into vogue, and in 1830 the lyric song in the hands of Alfred de Musset, Béranger, Victor Hugo, and Lamartine reached its height. In Paris the songs of the hour are from the opéras comiques, but in the provinces the national airs still exist. The songs of Auvergne are chiefly bourrées; in Burgundy, Noëls and drinking-songs; The Béarnois airs are melodious and pathetic; and in Normandy mill-songs predominate. See *Chanson*. The history of the song in Spain and Portugal is meagre, for although Spanish literature is rich in remains of ancient poetry, little music is preserved. Their songs consist chiefly of traditional street-ballads and dance-songs. In Italy the sonnets of Dante and Petrarch were among the first poems set to music. Ballate and Intuonale, love-songs and dance-songs; Maggiolate, May-day songs; and carnival songs had their day of popularity. In the 15th century the Netherland school influenced Italian music towards the church, and only such songs as the Frottole, Villanelle, and Villotte prevailed. Madrigali, canzoni, and arias for one voice came into fashion, and canti popolari occupied a place similar to that of the Volkslied in Germany. Italian energy spent itself in the opera and cantata, so that the song drifted into the aria, and the best songs of Italy are to be found imbedded in large works. The English song began with the bards, minstrels, and gleemen, who improvised the tunes to their recitations. In the 15th and 16th centuries social and political ballads multiplied. The most popular of Queen Elizabeth's time were: *The Carman's Whistle*, *Greensleeves*, *The British Grenadiers*, *Near Woodstock Town*, *The Bailiff's Daughter of Islington*, and *The Frog's Galliard*. In the 17th century the partiality for airs and dialogues was derived from the influence of Italian recitative, and it also became the custom to write new ballads and songs to old airs, a practice which Burns followed. Many ballads were sung in the reign of Charles II., such as *Barbara Allan*, *Come, lads and lasses*, and *Lillibulero* (q.v.). Between 1683 and 1690 are the names of Henry Purcell, John Eccles, and Richard Leveridge, the latter of whom wrote the famous *Black-eyed Susan* and *The Roast Beef of Old England*. A multitude of ballads appears in the 18th century. Besides giving his country *Rule Britannia* (q.v.), Dr. Arne set many of Shakespeare's songs with taste. Samuel Webbe, William Jackson, and Samuel Arnold fill the intervening space until Charles Dibdine is reached, whose *Tom Bowling*, and other sailor songs became so popular. To the same period belong John Percy's *Wapping Old Stairs*, James Hook's *'Twas Within a Mile of Edinboro' Town*, Charles Horn's *Cherry Ripe*, Bishop's *Should he*

Upbraid and Bid me Discourse, Mrs. Jordan's *Blue Bells of Scotland*, etc. Of modern English composers, Sir Arthur Sullivan, Hubert Parry, C. V. Stanford, Cowen, Molloy and Barnby are the leading song-writers. The school of Scandinavian music is comparatively recent. Lyric songs are rare, but the *Volkslied*, epic-songs, and herdsman's songs still exist, and are chiefly in the minor keys. The scale recalls the Mysolydian and Phrygian modes. All of the melodies bear strong national stamp, and are weird and romantic. Grieg, Gade, Svendsen, and Hartmann have preserved the national airs and songs. The songs of Hungary, Russia, and the Slavonic nations consist chiefly of patriotic and national songs, the melodies of which have been worked over by Rubinstein, Dvöřak, and Tschaisowsky. Germany possesses the most brilliant history of the song, extending from the period of the Minne- and Meistersinger through the *Volkslieder* of the 15th, 16th, and 17th centuries, to the artistic song which has reached its highest development in Schubert, Schumann and Robert Franz. See CHANSON; LIED; MINNESINGER; NATIONAL HYMNS.

The singing of birds is chiefly connected with the love-season; although some birds sing at other seasons also, during fine weather, and when food is abundant, as if merely to utter their happiness, and by uttering, to increase it. It is during the pairing-time that they are most vocal; the singing of many is continued with frequency also during the period of incubation, but with some change of character, exhibited in a marked degree by the chaffinch. The male alone sings. Female birds have voice also, but do not possess the power of warbling like their mates. The song of birds is not produced by the larynx proper, but by the *syrix* or lower larynx, a distinct organ.

There can be no doubt that the singing of the male bird is intended to attract and please the female, and that he delights in this display of his own powers. In this respect, there is no difference between the birds of most melodious song and those of harsh discordant voice. The crowing of the cock and the gobbling of the turkey have the same purpose as the song of the nightingale. In them may be also seen an emulation which is ready further to display itself in combats, and probably these take place among the males of all birds. But questions of rivalry seem in part to be decided among some of the songsters of the groves by mere musical displays. Caged birds evidently often sing from emulation. It is said that canaries may be taught to sing a complete tune from a musical box, adjusted to play one tune only. A mirror should be placed before the bird and over the box.

The imitative powers so remarkably possessed by the mocking-bird and a few other species, are to some extent possessed by many birds.

SONGHAY, or **SURHAI**, a negro nation of the central western Sudan, between the Niger and the Sahara. They are believed to have been in this neighborhood since the middle ages.

SONNEBERG, a t. in Germany in the duchy of Saxe-Meiningen; one of its principal towns; pop. '95, 12,167. It is 13 m. n.e. of Coburg, and manufactures and exports papier-mâché articles. In the vicinity are ledges of slate, which is quarried and made into pencils.

SONNENTHAL, ADOLF VON, an eminent Austrian actor, born in Budapest in 1834. He first worked as a journeyman tailor, but became connected with the court theater in Vienna, where he rapidly rose into such favor that, on the 25th anniversary of his engagement, he was knighted by the emperor—a distinction never before granted to one of his profession. In 1855, on a visit to New York, he was cordially received by his countrymen and the theater-going public. See Eisenberg, *Adolf Sonnenthal* (1896).

SONNET, a poem expressing one idea, mood, or sentiment, and usually extending to 14 decasyllabic lines, with a somewhat intricate arrangement of rhymes. It is one of the most refined forms of poetic expression. Every sonnet should be full and complete, though terse; and be firmly but gracefully rounded off. The oldest extant specimens of the sonnet are those of Vernuccio, of the 12th, and Peter delle Vigne, of the 13th c.; but it received its highest finish at the hands of Dante and Petrarch. In the 16th c. Wyatt and the earl of Surrey introduced the sonnet into English literature, and Sidney, Spenser, Shakespeare, Daniel, Drayton, and Drummond extended its use and scope. In the Italian models, the first eight lines make two quatrains, and the remaining six, two tercets. The quatrains have two rhymes, usually arranged so that the 1st, 4th, 5th, and 8th lines rhyme, as also the 2d, 3d, 6th, and 7th. In the tercets great liberty is allowed; but there are generally three rhymes, arranged in couplets. Shakespeare and Spenser used an illegitimate form. Milton's sonnet was a close approach to the true Italian type. Nearly all of our modern poets have employed this form of poetry. See *The Sonnet*, by Tomlinson; Henderson's *Petrarcha*; Löffl's *Laura*, etc.

SONNINI DE MANONCOURT, CHARLES NICOLAS SIGISBERT, an eminent French traveler and naturalist, born in 1751. Besides a residence for some years at Cayenne, he traveled in Egypt, Greece, the Archipelago, and Asia Minor. He made many valuable researches in natural history, and published several works, the chief being *Voyage dans la Haute et dans la Basse Egypte* (1799), and *Voyage en Grèce et en Turquie* (1801). Sonnini died at Paris in 1812.

SON OF GOD. Considered from the side of dogmatic theology, the phrase Son of God denotes the second person of the Trinity (q.v.). If we examine the use of the name in the Scriptures, we find it to have been applied by Jesus to himself, and given to him by

his disciples, to express the mysterious relationship in which he stood to God. The phrase was one not altogether unknown to the Jews. The plural "sons of God," occurs several times in the Old Testament; in some cases it is applied (tropically) to angels, in others to the children of Israel, and in their collective capacity as the favored nation, they are twice called by God his "son" (Ex. iv. 22, 23; Hosea xi. 1). The use made in the New Testament of the famous passage of the 2d Psalm ("Thou art my Son; this day have I begotten thee") is thought by some to constitute conclusive evidence that the spiritually-minded among the ancient people recognized a "Son of God." It has been argued, however, that if the Hebrews generally, or even their spiritual leaders, had believed the Messiah to be the "Son of God" in any other sense than that he was prophetically filled with the spirit of God, both the idea and the phrase would have played a far more prominent part than they do in the religion and literature of the nation. Nor does it appear that the idea of a "Son of God" (in the divine sense) had rooted itself in the Hebrew mind. Hence we find that the assumption of the title by Jesus provoked the bitterest opposition on the part of the great majority of his countrymen. They did not hate him because he claimed to be the "Messiah," the "Christ;" on the contrary, they were prepared to accept as such any teacher whose words or works might seem to them to justify his pretensions to the dignity; but when Jesus claimed to be the "Son of God," equal and one with the Father, they sought to stone him. It was, in fact, this assertion of his divinity that cost Jesus his life.

SONOMA, a co. in n.w. California, bordered by the Coast range and by San Pablo bay on the s., and on the w. by the Pacific ocean; crossed by the San Francisco and North Pacific and the Southern Pacific railroads; drained by the Russian river and by several creeks; 1548 sq. m.; pop. '90, 32,721. The surface is mountainous, and thickly covered with yellow and sugar pines, and fir and redwood trees. The beautiful valleys of Petaluma, Santa Rosa, and Sonoma are particularly fertile, having fine orchards and vineyards, the latter celebrated for its wine, which is lighter than that produced in other parts of the state, and suitable for champagne. The climate is mild and uniform. The geysers or hot springs are in the n.e. portion of the county. Co. seat, Santa Rosa.

SONORA, a frontier state in the n.w. of Mexico, bounded on the n. by the U. S. territory of Arizona, and on the w. by Lower California and the gulf of California. Area, 76,900 sq. m.; pop. '95, 191,281. Several fine bays indent the coast; lagoons occur near the shore; and in the western part of the state there are several lakes. The great system of the Andes skirts the eastern frontier, and throws off branches which occupy much of the surface of the state. In the w. the surface is mostly flat, with a fertile soil, and a warm but variable climate. The chief rivers are the Rio Colorado, Sonora, Yaqui, and Mayo. Two abundant crops are gathered every year from the same land; and the principal crops are wheat, maize, peas, and beans; though tobacco, sugar-cane, and cotton are also grown. But the wealth of the state is not in its agricultural capabilities, but in its mineral treasures, which are considered inexhaustible. "Hardly a village or grazing estate," writes a recent traveler, "but can show some vein of gold, silver, lead, or copper;" and he thinks that in all probability "not a fourth of its existing metallic wealth is known, while not a moiety of that has been or is being developed." The capital is Hermosillo; Guaymas is the chief port. *

SONRHAI. See **SONGHAY**.

SONSONATE, a t. of Central America, in San Salvador, and 36 m. w. of the city of that name. Pop. '78, 5127, present population estimated at 8000.

SONTAG, HENRIETTE, an eminent German vocalist, was b. in 1806, and educated for the stage. After a brilliant operatic career at Vienna, Berlin, Paris, and London, she married count Rossi in 1828, and left the stage in 1830. Compelled by pecuniary difficulties to reappear in 1849, she met with renewed success both in Europe and America. She died in Mexico in 1854.

SOO-CHOW, or **SU-TCHOU**, or **SOO-CHOW-FOU** (*fou* merely signifying *city*), a large city of China, in the province of Kiang-su, 50 m. w.n.w. from Shanghai. It stands near the Grand canal which connects Hang-chow with Nankin and Peking, but its port is Shanghai, with which also it has water-communication. It is about 10 m. in circumference, and is inclosed by fortifications, outside of which are 4 very large suburbs. The country around Soo-chow is level and remarkable for its fertility, so that the Chinese speak of it as a terrestrial paradise. The city has silk manufactures, printing establishments, and a large trade in books. In 1857 Soo-chow was captured and sacked by the Taepings. In 1863 it was invested by the imperialists, under a British officer, and, the rebel chiefs having surrendered, were treacherously beheaded. Pop. about 500,000.

SOODAN, SOUDAN, or SUDAN, a vast tract of central Africa, bounded on the n. by the Sahara; on the w. by Senegambia; on the s. by Upper Guinea, from which it is separated by the Kong mountains, and on the e. by the Abyssinian highlands. The Niger (q.v.) waters the western regions, and in the e. are lakes Tchad and Fittri. It has an area of over 2,000,000 sq. miles; estimated population from 80,000,000 to 90,000,000.

Iron and copper are abundant, and gold, lead, tin, saltpeter, and sulphur occur. Salt, however, is entirely wanting and has to be brought across the Sahara. Of agricultural products, cotton and indigo are abundant, wheat, rice, maize, and millet are among the ordinary crops. Western and central Soodan are divided into the independent or protected states of Gando, Sokoto, Adamawa, Bornu, Baghirmi, and Waday. Eastern Soodan comprises Darfur, Kordofan, Senaar, Taka, the Equatorial province and the Bahr-el-Ghazal province, which were all under Egyptian rule until 1882, when, owing to bad government, and the excessive greed of the petty governors, who were absolute rulers in their respective provinces, there was among the tribes a very general dissatisfaction with the Khedive's authority. They were eager to avail themselves of any opportunity for riddance of their burdens; and when Egypt's military power became weakened, El Mahdi or "the False Prophet" incited the political and religious insurrection, in which England was compelled to take part by reason of her connection with Egyptian affairs. When Hicks Pasha's army, sent by the Khedive against El Mahdi, was massacred at Obeid, England determined to withdraw from the Soodan; but in the mean time the garrisons at Suakim, Tokar, Sinkat, Kassala, Berber, and Khartoum had been surrendered by El Mahdi's followers. Gordon and Stewart were sent across the desert to reinforce Khartoum; Gen. Graham, with 5000 men, was sent from Suakim to the relief of Tokar, and succeeded in rescuing part of the garrison, but, finding it impossible to cross the desert to Berber, and thence to Khartoum, returned to lower Egypt. Gordon reached Khartoum in the spring of 1884, and after several fights with El Mahdi's troops, was surrounded and cut off from communication with Cairo. In the fall, an expedition under Lord Wolseley was sent by way of the Nile to relieve Gordon, and preparations were made to send a large force, under Gen. Graham, across the desert to Berber; but in Feb. came the lamentable news of the fall of Khartoum and death of Gordon. No fighting of importance was subsequently done, El Mahdi's forces retired, and the English forces were withdrawn. At the death of the Mahdi, one of his lieutenants, Khalifa, succeeded to his power, and has since ruled over the revolting provinces. Of the prisoners captured at Khartoum, one of the most distinguished, Slatin Bey, escaped in March, 1895. In 1896 the severe defeat of the Italians in Erythrea, and the alleged restlessness of the dervishes led the British government to make a demonstration of force from the frontier into the Soodan. After repeatedly defeating and repulsing the dervishes, the expedition finally captured Dongola, Sept. 23. In 1897 the British advance was resumed in July with the purpose of capturing Abu Hamed, in order to make it the temporary terminus of the new railroad which is being pushed across the desert at the rate of about two miles per day. The attack on Abu Hamed took place on Aug. 7, when the Egyptian army won a brilliant victory, driving out the dervishes and occupying the town. Abu Hamed is an important stepping-stone to the recovery of Berber and Khartoum.

SOOLOO' ISLANDS. See SULU ISLANDS.

SOOT is that portion of fuel which escapes combustion, and which is mechanically carried up by the current of hot air, either to be deposited on the sides of the chimney, or to be discharged into the atmosphere. The soot of coal and that of wood in all probability differ materially, the former containing more carbonaceous matter and more ammoniacal salts than the latter. Continued contact with soot often gives rise to a peculiar form of cancer, which is consequently known as *chimney sweepers' cancer*.

SOPHIA, the capital of Bulgaria, 170 m. n.w. of Adrianople, in a plain on the Bogana, a branch of the Isker. It contains numerous mosques, and several Christian churches; is the see of a Greek and a Roman Catholic archbishop, and carries on manufactures of cloth, leather, silk goods, and tobacco. Its hot springs and baths are highly esteemed. Pop. '93, 47,000.

SOPHIA DOROTHEA, 1666-1726; b. Germany; called princess of Ahlden; daughter of George William, duke of Celle, and a French lady. She was celebrated for her beauty; and in 1682 she married George Lewis (eldest son of her cousin, the elector Ernest Augustus of Hanover), who became George I. of England. She was divorced in 1694 on account of her intimacy with Königsmark, a Swedish colonel whom she had known in her youth; the intrigue resulting in the assassination of the adventurer and her banishment for life to the castle of Ahlden near Celle.

SOPHISTS. The Sophists were the leading public teachers in ancient Greece during the 5th and 4th centuries B.C., and their character has been a subject of much dispute. Most of the historians of philosophy—influenced seemingly by the lampoons of Aristophanes, the comic poet, and by the disparaging remarks of Socrates, Plato, and Aristotle, who stood in a quite different position from the teachers by profession—represent the Sophists as "ostentatious impostors, flattering and duping the rich youth for their own personal gain, undermining the morality of Athens, public and private, and encouraging their pupils to unscrupulous ambition and cupidity."

A Sophist, in the original sense of the word (derived from *sophos*, wise or learned), was a wise man, a clever man, one who stood prominently before the public for intellect or talent. Solon and Pythagoras are called Sophists; the name was applied even to great poets. Socrates was repeatedly so designated; Plato is alluded to by the same title. By the general public, any man of intellectual eminence would be spoken of as a Sophist. With the feeling of admiration toward the intellectual class, there was

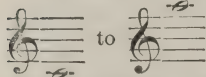
mixed up a certain invidious sentiment, from whatever cause arising; and the name Sophist being often used to express the dislike as well as the admiration, came ultimately to have a predominating bad sense. Still, the general public, in the use of the word, comprehended Socrates, Plato, and Aristotle, and their philosophical disciples and followers, equally with the professional teachers.

The great intellectual start made in Greece during the 5th c. B.C., led to an advanced standard of general instruction. There had been an established popular education long before—including music, reading, and recitation—but now there were found among the public teachers men of the highest accomplishments that the age could furnish, who taught whatever was known of astronomy, geography, and physics, as well as the newly started controversial discussions in ethics and in metaphysics. These men shared with the other intellectual celebrities the title of Sophist. But there was one circumstance in their case that greatly deepened the invidious sentiment—they taught for pay. This brought them under the odium of two classes: in the first place, the poor, who could not afford the fees, felt themselves in a new position of inequality with the rich; secondly, the philosophers, properly so called, who had not yet begun to receive money from their disciples, held in contempt those that did. Both Socrates and Plato had a vehement repugnance to the idea of a money-bargain between master and pupil; in their eyes, the relationship was one of pure attachment and devotion; and they considered that all the invidious part of the designation Sophist, and more, was richly deserved by the teachers for hire; and as these public teachers, by the nature of their vocation, would probably be often shallow and superficial, as compared with the great philosophers, we can understand the full definition of Sophist by Aristotle—"an imposturous pretender to knowledge, a man who employs what he knows to be fallacy, for the purpose of deceit and of getting money." With all the great authority of Aristotle, this charge applied indiscriminately to the body of men employed in training youth for active life, will not bear investigation. Enough is known of the lives, characters, and doctrines of the class to refute the accusation. The Sophists were a profession growing out of the circumstances, and supplying a want, of the age. The most valuable ideas and habits of any accomplished Athenian were due to his education under some teacher of the class Rhetor or Sophist. So far from the age of the Sophists being an age of corrupted public morality, Mr. Grote contends that it was the reverse. He adduces a multitude of historical facts to prove that the morality of the Athenian public was greatly improved at the end of the 5th c. B.C., as compared with the beginning of that century.

SOPHOCLES, the great master of Greek tragedy, was b. at Colonus, a village about a mile from Athens. The date of his birth is not exactly known, but is fixed at 496 B.C. Sophillus, his father, a man of good birth and fortune, bestowed much care on his son's education; insomuch that, aided by his highly prepossessing appearance, Sophocles was selected for his skill in poetry and music to lead with dance and the lyre, after the victory of Salamis, the chorus of youths in a triumphal pæan composed by himself. In his 28th year he is said to have exhibited his first play; and three years before, in a contest with rival scenic writers, one of whom was Æschylus, he gained the first prize, by the decision of the judges Cimon and his colleagues. He had, by Nicostрата, two sons, and one by Theoris, a Sicyonian woman. Iophon, one of his two sons by Nicostрата, summoned him in his old age before the Phratores, on the charge of incapacity to manage his private affairs, but he refuted the charge by reciting to the court a beautiful chorus from his *Œdipus in Colonus*. He died at the age of 90, full of years and honors. His private character was easy and contented, but not, as has been hastily assumed, profligate. His turn of mind was devout, as is evident throughout his plays; and he evinced no taste for political or active life, although he is said to have accepted command in the Samian war. He was a prolific author. He was the reputed composer of as many as 130 plays, of which, however, 17 have been deemed spurious. He gained, according to his biographer, the first tragic prize 20 times, bearing the palm on several occasions from Æschylus and Euripides, not to mention less well-known competitors. He wrote also pæans, elegies, and epigrams, of which we have but few remains. He lived on terms of intimacy not only with his great rivals, but with Aristophanes and Herodotus. We have no knowledge of the order in which his plays, that have survived, were written. The most plausible arrangement is perhaps that of Müller, who graduates them as follows: *Antigone*, *Electra*, *Trachiniae*, *Œdipus Rex*, *Ajax*, *Philoctetes*, *Œdipus Coloneus*. Sophocles is justly accounted the most perfect of the Attic tragedians. In his hands tragedy becomes the true and faithful reflex of human feelings, passions, impulses. His ideas are ethical, with a constant reference to a divine disposer of events. "There has hardly," says Müller, "been any poet whose works can be compared with those of Sophocles for the universality and durability of their moral significance. Of all the poets of antiquity, he has penetrated most deeply into the human heart." His versification is remarkable for its softness and fluency. The best editions are those of Wunder (Gotha and Erfurt, 1831-46) and Schneidewin. The chief translations of Sophocles into English are those of Potter (Lond. 1788), Dale (Lond. 1824), and Plumptre (1865). We may also mention special translations by Prof. Thompson of the *Ajax*, by Dr. Donaldson of the *Antigone*, and by Prof. Campbell of the *Antigone* and *Electra*.



SOPHOCLES, EVANGELINUS APOSTOLIDES, LL.D., b. Greece, 1807; educated at Mt. Sinai convent and at Amherst college in the United States, whither he emigrated. He was tutor in Greek, for most of the time between 1842 and 1859 at Harvard college, where from the year 1860, he was prof. of ancient, modern, and Byzantine Greek. Among his publications are a *Greek Grammar* (1838); *Romæ Grammar* (1842); *Catalogue of Greek Verbs* (1844); *History of the Greek Alphabet* (1848); *Glossary of Later and Byzantine Greek* (1860), of which a revised edition appeared in 1870 as *Greek Lexicon of the Roman and Byzantine Periods*. He d. 1883.

SOPRANO (Ital.), the highest species of female voice, whose range extends from



to , or in some cases higher. The highest notes generally belong to the

false alto register. Sweetness and mellowness are the characteristic qualities of a soprano voice, which is for the most part less full than an alto, but lighter, fresher, and more expressive of joyful, lively, and highly impassioned feelings. A voice sometimes distinguished as intermediate between alto and soprano, is the *mezzo-soprano*, whose usual

compass is from  to .

SORA, a city of southern Italy, in the province of Caserta, with '81, 5411 inhabitants. It stands in a fertile plain, watered on one side by the Liris or Garigliano, which is spanned by two bridges at the town. The population is industrious and wealthy. There are manufactories of woolen cloth and of paper. Sora was originally a Volscian town, passed into the possession of the Samnites, and then into that of the Romans.

SORAC'TE, a mountain in ancient Etruria, in the territory of Falisci, called Monte di San Silvestro, and at present Monte di Sant' Oreste, from a village situated on its side noted for its sour wine. It is 25 m. n. of Rome, separated from the Apennines by the valley of the Tiber, and rises abruptly 2420 ft. above the adjacent plain. It had formerly on its summit a temple dedicated to Apollo, to which companies of worshippers proceeded from Rome with great solemnity. The monastery of San Silvestro, which now occupies the site of the temple, was founded by Carloman in 748.

SORAU, a t. of Prussia, in the province of Brandenburg, 60 m. s.s.e. of Frankfort-on-the-Oder. It has important bleach-field, print-works, and color-works, iron foundries, and a manufactory of porcelain. Pop. '95, 14,814. Sorau is one of the oldest towns in Prussia.

SORB. See **SERVICE**.

SORBET. A drink or beverage much used in the East, compounded of lemon-juice, water and sugar, with a flavoring of rose-water or other ingredient to improve the taste; sometimes perfumed cakes are dissolved in it which are specially prepared. The name is also given by our confectioners to a kind of ice.

SORBONNE, a celebrated academic body at Paris, which dates from the middle of the 13th c., and which, down to the French revolution, held a prominent place in all church controversies. It derives its name from its founder, Robert de Sorbon, a canon of Cambrai, born at Sorbon, in the Ardennes, in 1201. He was selected by Louis IX. as his chaplain and confessor. At this time the university of Paris was at the very height of its celebrity, and Robert de Sorbon resolved on opening in it an institution in which a society of secular priests, being provided with all the necessaries for their own maintenance, should devote themselves gratuitously to the teaching of theology. It was established with the sanction of King (afterward St.) Louis in 1252, originally for the reception of 16 scholars, four respectively from the Gaulish, Norman, Picard, and English nations, to which the German was subsequently added. Robert was himself the first head; and in 1270 drew up its constitution, which remained in force without any substantial alteration till the French revolution. It was not confined to the original poor scholars, but extended to the bachelors and doctors aggregated to the body of the Sorbonne. All these were of necessity graduates of the faculty of theology of the university of Paris, but they were only admitted to membership of the Sorbonne by the votes of that body, which formed one of the four constituent parts of the theological faculty, and after a public disputation, technically called the "Sorbonica," or "Robertina," in which the disputant was required to sustain against all antagonists, from the hour of five in the morning to that of seven in the afternoon, theses or propositions selected from the whole range of theological science. The first disputant was a Franciscan friar named Mayron, a scholar of John Duns Scotus; but he was followed by many of the greatest names in mediæval and post-reformation history. These "Sorbonne acts" form in some respects one of the most characteristic chapters in mediæval literary history. The disputants in some cases exceeded 60 in number. The foundation of Robert de Sorbon was approved in 1268 by Clement IV.; but the name of Sorbonne does not appear to have been appropriated to it till the 14th century. Robert de Sorbon also established another preparatory college for the study of the humanities and philosophy, which was called the

college of Calvi, or the little Sorbonne. In the 15th c. the Sorbonne, as being in great measure identified with the theological faculty of the Paris university, holds an important place in the history of theological controversy, and in all the contests which followed the reformation in France; there being few of the great names of the Gallican church which are not included in its academic roll. Among the munificent works of the great cardinal Richelieu, who was a pupil of the Sorbonne, was what may be described as a complete reconstruction of the buildings. The new Sorbonne comprised, in addition to the public academical hall, lodgings for the 36 doctors, which were assigned to the doctors successively in the order of seniority. The head of the Sorbonne institute was called provisor, and was elected by the members together with the archdeacon of Paris, the four deans of faculty, and some other dignitaries of the university. Besides the resident members of the Sorbonne, there were also external associates, called "Soci-Hospitalitatis," who had no share in the governmental acts of the institution. The Sorbonne continued in the enjoyment of its privileges and its revenues down to the revolution, when it shared in the common ruin of all the ecclesiastical establishments of France. At the re-organization of the university by Napoleon in 1808, the Sorbonne was re-established as the theological faculty of that body; but it failed to recover its old prestige even with the clerical body. One of the conditions of membership was an oath to maintain the celebrated four "Gallican propositions." See GALLICAN CHURCH. This condition deterred many; and although it was revoked by the proposed concordat of 1817, yet on the failure of this concordat, it still continued in force down to the revolution of 1830. In the more recent organization of the university of France, the Sorbonne has resumed its place as the representative of the faculty of theology, with seven professors and a dean of faculty. The professorships are of dogmatic theology, moral theology, sacred scriptures, canon laws, church history, Hebrew, and sacred eloquence. These professors, however, are named by the minister of public instruction; and the absence of control on the part of the bishops over their appointment and their teaching has led to the general withdrawal of clerical students from the schools. Nevertheless, the Sorbonne still possesses at least the permissive sanction of the church. But the Sorbonne is now further the seat of two other faculties of the Académie de Paris (i.e., Univ. of Paris, see UNIVERSITY), those of letters and sciences; there being 12 chairs in the former faculty, and 7 in the latter.

SORCERY. An analysis of sorcery reveals the fact that it arose in every country and every tribe, with the earliest consciousness of the human being. As soon as man awoke to the knowledge of himself, as a part of creation, and felt his power, his first desire was to interfere with the workings of nature for his own wishes and needs. Thus the sorcery of the lower races may fairly be said to have developed among them, and the evidence of its remote antiquity lies in its presence among all races. The life of sorcery is the belief in the working of spirits or souls of the dead, and this faith is the substratum of the philosophy of religion from that of the lowest savages (see ANIMISM), up to that of civilized men. In the first stages of civilization the distinction between religion and sorcery hardly appears, the functions of priest and sorcerer being so blended as to be practically the same. The native Australian of the present day, scarcely believes a man can die, even a natural death, unless by being bewitched, and diseases are induced by the sorcerer only for the purpose of extracting profit from them; hence, as their belief lies in the fact that spiritual beings affect or control the events of this world, and man's life here or hereafter, this belief naturally leads to active reverence and propitiation. Storm and thunder come through the influence of the sorcerer; shooting stars and comets are to the natives omens of disaster; the great hawk's cry in the night portends the death of a child, whose soul the bird is carrying off; but when a man's finger-joints crack, he stretches out his arm, for in that direction some one is doing him a kindness. The sorcerer can bewitch him to death by pointing at him the leg-bone of a kangaroo, or he can steal away his kidney fat in which his strength lies, or he can get a lock of his hair and roast it with fat over the fire, until its former owner pines away too. It is believed that pre-historic men were addicted to magic, as in the Swiss lake-dwellings implements of baked earth have been found supposed to be amulets and relating to Moon-worship. The absence of all bones of hares in the kitchen refuse is generally supposed to be owing to a superstitious avoidance of that animal's flesh. Thus sorcery may be reckoned as among the earliest efforts of human thought, and it is found equally disseminated throughout the Pacific islands, South America, among the Indians of North America, Africa, and Madagascar.

When the Africans came in contact with the Arabs, who had a higher civilization, but still retained their magic, they borrowed from them. As an instance, the Africans have appropriated the Arab's system of lucky and unlucky days of birth, which, with their native ferocity has caused the death of thousands of children whom they believed to have been born in an evil hour. The sorcery of Egypt and Assyria, although more cultured, and worked into more elaborate system and ritual, scarcely differed in principle from that of the most barbaric ages in the remotest times. Their formulas, many of them still remaining, were mostly of religious Magic (q.v.)—that is, they invoked the aid of deities; but these were evidently evolved from still earlier, as is shown in instances where they have relied upon old or foreign words for their power over their gods. These formulas had, and still have great influence over the minds of the superstitious rustics, and their appearance in medicine then, and for ages afterwards, is

evidence of the wisdom of the physician in not discarding the use of the supernatural charm. The Egyptian calendar of lucky and unlucky days, made from an astrological point of view, is still in use in the modern Egyptian almanac; for instance, a child born on the fifth of the month Paopi, will be killed by a bull. The world of the Babylonians was peopled with hosts of nature-spirits and demons, and they had set formulas for propitiation and expulsion. In the rites of the priests this kind of supernatural power was exercised by means of sacred texts either chanted or tied on as phylacteries. A remarkable passage occurs in Ezekiel XXI, 26, in which three methods of divination are mentioned as used by the king of Babylon as he stood at the head of two ways: "He shuffled arrows, he consulted teraphim, he looked in the liver." The five planets which they called "interpreters," they consulted to foretell the wind, or rain, or heat, comets, eclipses of the sun or moon, atmospheric changes, beneficial or otherwise to nations, kings, or common men. The twelve signs of the Zodiac originated with the Babylonians, also the association of the fixed stars with the planets and the gods in a system which the later nations of Europe and Asia have followed with superstitious veneration. Thus what may be called the higher branches of sorcery or magic descended to us from Egypt and Babylon, and although the beliefs and ceremonies of ancient Eastern nations, such as Asia Minor and India, would be interesting in this connection, yet sorcery has come to us more directly from the West, and we follow that line.

The early Greeks and Romans relied upon oracle gods or goddesses, for their influence in Magic, and erected temples specially for them; and in their rites and ceremonies may be traced much of the rude old sorcery inherited from their barbaric ancestors. There was a famous oracle of this kind near the river Acheron in Thesprotia where departing souls crossed on their way to Hades; and the shrine of Apollo at Delphi was renowned throughout the world for the wisdom of the prophecies which issued from it. They worshiped the Moon, under the name of Hecate, as the controller of night phantoms, and called upon her to shine clear while they performed their magic rituals of love and hate, scattering their lovers' bones with the barley they gave to the winds and melting him to love by melted wax. They also had their belief in bewitching and the evil-eye (q.v.), which bad influences they averted by spitting, symbolic gestures, and the use of charms and amulets. In Rome much of the magic was only Greek sorcery in a Latin guise. Cicero, himself an augur, gives us in his elaborate work *On Divination* very many omens and magical formulas adopted from the Etruscans. Probably in no other country of advanced civilization was the same amount of attention given to the utterances of oracles, in high official circles, as in old Rome. Signs of magic sanction were demanded before every public act, and divination was a religious system of consulting the gods. Egyptian and Babylonish sorcerers thronged the temples at Rome, where their magic arts were well received. The Pythagorean philosophy, although more scientific in its nature, still favored the growth of magic by mystical speculations, particularly on numbers. This delusive science had long been in use in Babylon, where the planetary *seven* and the zodiacal *twelve* were duly recognized, and good deities were indicated by whole numbers and evil demons by fractions. The Pythagoreans added the active *one* and the passive *two*, the sacred *four* of space, proceeding from the *one*, the *seven* of intelligence, the *eight* of love, and the *ten* of the universe. The doctrine of Neo-Platonism (q.v.), introduced by Plato (q.v.), soon followed, and its devotees, instead of simply speculating upon the demoniac powers of the universe, aspired to establish personal relations with them and influence them in accordance with their own wishes. The systems of theurgic magic, in which sacrifices, diagrams, invocations, talismans, were used with rule and method, as though they were really effective, became more fascinating than ever. Many of these delusions have perished or become unintelligible, but the "survivals" prove the strong hold they had upon the minds of men. After the captivity of the Jews, the theurgy which was handed down into the Middle Ages partook strongly of Jewish speculation. By them angels and demons were freely introduced; Gabriel and Raphael, Beelzebub, and Ashmodai, who was undoubtedly the great evil demon *Ashina-dava* of the Persian religion. The Jewish magician relied upon the power of divine Hebrew names, such as *shem hamphorash*, or the name of Jehovah in its true pronunciation, which Solomon and other wonder-workers used with marvelous effect. He drew powerful spells from the *Cabbala* (q.v.) of the later Jews, but in his intercourse with spirits he used Hebrew and Greek in admired confusion. One of the most curious relics of the days of sorcery is the pentagram, which was an essential feature in the magic circle, to which allusion is made in a scene in *Faust* by Goethe (q.v.). This symbol came from the Pythagoreans. It is a geometrical figure for the construction of the regular pentagon (Euclid IV. prop. 11), now familiar to every student, but which to the school of Pythagoras was so great a novelty that it was used as a sign of fellowship, and it afterwards became a magical symbol, still to be seen in use in every country from Ireland to China.

The magic of the Moslem world was in part adopted from Jewish angelology and demonology and in part from Babylonish and Greek astrology, wrought out by such men as Paul of Alexandria and Claudius Ptolemy; and the modern wizard in England would be able to fraternize with his brother sorcerer in Bagdad or Delhi, so similar are their

fumigations, incantations, horoscopes, etc. The ancient Hindu magic was mostly religious, turning on the actions of demons in causing diseases by possession (q.v.) and their exorcism (q.v.). A knowledge of the early Aryan (q.v.) rites sometimes throws great light on European practices derived from the same stock. Thus the magical practice of going round "with the sun" well known as *deasil* in Highland Scottish superstition, and remembered in England in the rule of passing the decanter "through the buttonhole," appears to be a rite of Aryan sun-worship handed down from remote antiquity, for (under the name of *pradoxina*) it seems to form part of the Hindu marriage ceremony, passed along from Vedic times. Among the Mongols, the sorcerer priests are very remarkable types of their ancient clan. They have a peculiar system of reckoning days, months, and years by a zodiac-calendar, whose signs *ape, horse, dog*, etc., are combined in series with the elements, male and female, so that a certain year may be called that of the "female fire dog," and it recalls the Egyptian zodiac. The magic of China is remarkable for its various elaborate modes of divination. The most in vogue at present may be obtained from mediums possessed by spirits who either speak or write with the "descending pencil," as has been done lately by spiritualists in America and Europe. Or they divine by sacred lots, "eight diagrams," or "wind and magic." It must not be supposed that sorcery was allowed to flourish without persecution; but the opposition did not infer any skeptical doubts as to its reality. Magic was none the less true to them for being hated and persecuted; it was only that the prophet was false, not that magic was unreal, that one particular sorcerer was pretending to supernatural power he did not possess. The Levitical law prohibited sorcery under penalty of death (Levit. XX. 27.). Among the early Christians sorcery was recognized as miracle, but against the law, and magic acts, such as turning men into beasts, calling up familiar spirits, raising storms, etc., were not alluded to in an unbelieving spirit, but with condemnation.

As Christianity gradually swept over Europe, the same antagonism continued, the church endeavoring with some success to subdue the old traditional religions, and the "survivals" of superstition. In this way gradually arose the legal persecution of witches, which was continued with so much zeal through the Middle Ages under both Catholic and Protestant churches. It is wonderful how the faith of even the educated classes in the reality of magic remained unbroken for centuries, and how its more respectable branches, such as astrology and alchemy were largely followed; but we find included in their scope much of the science of the period. When the question, whether the supposed effects of magic really took place or not, was raised, during the sixteenth and seventeenth centuries, the final fall of magic began. In our day the science of sorcery is dying out, although astrology still has its votaries, and the "spiritual communications" through mediums and "spirit writings" might still be classed under the head of necromancy. The kind of sorcery most popular to-day in Europe is known as folk-lore (q.v.), and it is full of precepts for bewitching and averting witchcraft and divining omens. Although modern thought would reject entirely the idea of magic and sorcery, it must not be forgotten that the connection between religion and sorcery has always been of the closest nature, and from the pursuit of magic arts has come some of the most valuable revelations of science. Many of the delusions of magic may be accounted for by the strong connection between the thought and the wish concerning an object, and, by constantly thinking evil about things, it is one of the chief practices of the sorcerer to try to make them happen. On the other hand, the subject of this influence knowing that he has been bewitched, suffers in reality from fear, sometimes even dying from it. Thus the strong belief in this mysterious power furnishes the basis of much of the so-called witchcraft among savages, and it is to the interest of the sorcerer to extend this influence and strengthen it in every way. In many parts of England and Scotland, country folk may yet be found who believe some neighbor has the power to "overlook" an animal or child for evil, and revenge may be taken upon that neighbor under the idea that he is a sorcerer. As late as 1618, two women were executed in Lincoln, England, for burying the glove of Lord Henry Rosse, so that, "as that glove did rot and waste, so did the liver of the said lord rot and waste." So many of these aphorisms are found in folk-lore, which is treated elsewhere, that it is not necessary to repeat them, as they only serve to carry out the idea of the analogy between thought and object. In astrology this connection is still stronger, as good or bad luck often depends upon whether a star is above or below the horizon at the time of a man's birth, and the signs of the zodiac determine whether a person is just or unjust. Analogy always precedes scientific results. Amidst all its delusions and mischiefs, magic has been a source of real knowledge, for as experience corrected its errors and formulated its theories by the more exact ones of science, much of what was regarded as magic passed into the domain of science. The delusions were left behind in the mystery of occultation, still subject to further operations in that direction. Astronomy grew up in Babylon, not through the quest of mechanical laws of the universe, but through observation of the heavens to gain a fore-knowledge of war and harvest; and Kepler himself was led to his discoveries in physical astronomy through mystic magical speculations. In alchemy we may trace the early history of chemistry, which only appeared in modern times free from its magical environments. The connection of the metals with astrology, which was one of its fundamental ideas, each

metal having its planet, may still be observed in the name of the metal "Mercury," and that of "lunar caustic" for nitrate of silver. See SUPERSTITIONS.

SORECIDÆ, a family of mammalia, of the order *carnaria*, and section *insectivora* of Cuvier. They are generally small animals, covered with soft hair; under which, on each flank, is a band of stiff closely-set bristles, and among them glands which exude a peculiar odorous fluid. The legs are short, and the feet are five-toed, and generally formed for burrowing. Some species are aquatic, and their feet webbed. The sorecidæ are all plantigrade. Most of them are nocturnal animals. They generally feed on insects and worms. A remarkable characteristic of the family is the elongated muzzle.

SOREL, city and co. seat of Richelieu co., Quebec, Canada; on Richelieu river at its mouth in lake St. Peter, and on the Montreal and Sorel railroad; 45 m. n.e. of Montreal. It is on the site of a fort built in 1665; was for many years the summer residence of the governors of Canada; and has large ship-building and manufacturing interests. Pop. '91, 6669.

SORGHUM (see DURRA). It has the same climatic limits as Indian corn, though within these limits not always producing sugar. Early spring, warm summer, and late fall, are the essential climatic conditions. Its shortest period of growth and ripening is 100 days. It undergoes change soon after being cut, and if there be much variation in temperature, fermentation begins. The cane contains from 9 to 12 per cent. of sucrose, and about one-third as much other sugars, which not only do not crystallize, but prevent about an equal weight of the sucrose from crystallizing, so that, allowing for this loss, not more than 2.37 per cent. of dry sugar is obtained, or about 46.4 lbs. per ton. The milling does not extract all the sugar, some 25 or 30 per cent. being left in the vassage. The diffusion method has been used, and by it nearly all of this residue is saved; but, on a small scale, the process is much more expensive than milling. The juice is about 89 per cent. of the weight of the cane, and 85 per cent. of it can be gotten by diffusion. S. contains two-thirds as much sucrose as the tropical sugar-cane, and attempts have been made to remove the sugars preventing the sucrose from crystallizing; lime and sulphurous acids are the agents employed, but they do not remedy the difficulty. See SUGAR.

SORMA, AGNES, (AGNES MITO VON MINOTTO), German actress, born in Breslau, May 17, 1865. She appeared first in children's roles, at the age of fourteen, at the *Stadt-theater* in Breslau. From 1880 to 1882 she played successively in Görlitz, Posen, and Weimar, when she was engaged by the management of the *Deutsche Theater* at Berlin, where she has remained ever since with the exception of the years 1890-92, during which she was connected with the *Berliner Theater*. During the season of 1896-7 Sorma visited the United States, where she made a great success in Hauptman's *Versunkene Glocke*, and as *Nora* in Ibsen's *Doll's House*.

SOROCABA, a t. of Brazil, in the province of São Paulo, on the Sorocaba river; 60 m. w. of São Paulo. Important annual fairs are held, chiefly for sale of horses and mules. Pop. est. 12,000.

SOROSIS, a women's club in New York; organized March, 1868, occasioned by the refusal to women of equal privileges with men at the Dickens dinner—Mrs. Jennie C. Croly leading in the movement. It is divided into nine working committees: art, science, music, literature, higher education, philanthropy, the drama, house and home, and working women. Its meetings are held at Delmonico's on the first and third Mondays in each month; at the first, friends of members are entertained by social exercises, in charge of two of the committees; at the second, for members only, facts relating to the advancement of women and other topics are discussed.

SORREL, *Rumex*, a genus of plants of the natural order *polygoneæ*, very closely allied to *polygonum* (q.v.) and *fagopyrum* (see BUCKWHEAT), but having the perianth divided into six segments, the three inner of which enlarge and cover the *achenium*. The genus is very naturally divided into two sections, the first of which is already noticed in the article DOCK. The name sorrel belongs only to the second, characterized by diœcious flowers, and acidity of stems and leaves. COMMON SORREL (*R. acetosa*) is a perennial found in meadows and pastures throughout the whole of Europe, and is very plentiful in Britain. Its stem is from a foot to two feet high; its leaves arrow-shaped. It is an agreeable salad, and is used in soups and sauces, and as an addition to dishes of greens. It is therefore sometimes cultivated in gardens.—FRENCH SORREL, or ROMAN SORREL (*R. scutarius*), a native of France and Italy, has broader and blunter leaves, and is more frequently cultivated than common sorrel, being considered of finer flavor. SHEEP'S SORREL (*R. acetosella*) is a very similar plant, but of much smaller size, and its roots run very much under-ground, so that it is a very troublesome weed in gardens and fields of poor dry soil, in which it is very common in all parts of Britain.—For WOOD SORREL, see OXALIDÆ. For the RED SORREL of the West Indies, see HIBISCUS.

SORREL TREE, *Lyonia arborea*, formerly *Andromeda arborea*, a tree of the natural order *ericeæ*, remarkable in that portion of the order to which it belongs for its magnitude. its near allies being generally small shrubs. It grows chiefly on the Alleghany mountains, from Virginia to Georgia, and attains a height of 50 ft., with a trunk 12 to 15 in. in diameter. The wood is of little or no use. The leaves are acid, and are sometimes used for dyeing wool black.

SORRENTO (Lat. *Surrentum*, Gr. *Syrentum*), a maritime t. in the s. of Italy, province of Naples, is situated on the s.e. side of the beautiful bay of Naples, on the promontory which separates the latter from the gulf of Salerno, about 7 m. s.w. of Castellamare. Pop. (commune) '81, 7869. It is an archiepiscopal see, and possesses a cathedral. The manufacture of silk is extensively carried on. There are still considerable remains of the walls which were erected in the middle ages, and on the landward side it is surrounded by a broad and deep ravine, the side toward the sea being protected by precipitous rocks. On the n.w. of the town is a considerable plain or table-land, called *Piano di Sorrento*, about 1000 ft. above the sea level, surrounded and protected from the cold e. winds by a range of hills; it is intersected by numerous gorges and ravines, studded with villas and farm-houses, and covered with orange groves and vineyards; all which combined render the vicinity of the city in a high degree picturesque. It is celebrated for the mildness, dryness, and general salubrity of its climate, on which account it has been much resorted to both in ancient and modern times by invalids and convalescents. Among the Romans the wine of Sorrento was held in high reputation; it had to be kept about 25 years before it arrived at maturity. S. was probably originally a Grecian colony. Of the Roman city nothing remains except some subterranean cisterns, and a few fragments and substructures dignified with pretentious names. Tasso was a native of Sorrento.

SORTES BIBLICÆ, SORTES VIRGILIANÆ, etc.—Among the ancients, a favorite kind of divination was that known as *stichomancy*, or divination by lines of poetry. The method pursued was to select a number of verses from a poet, mix them together in an urn, draw one out at random, and from its contents to infer good or evil. As Virgil was the most popular and admired of all the Latin poets, his writings, and especially the *Æneid*, became the favorite book for this purpose, and it was undoubtedly this practice that laid the basis of the great reputation as a magician Virgil enjoyed during the middle ages. The Sibylline oracles were also much used for the same purpose. The practice did not cease with the introduction of Christianity; but instead of Virgil, or, to speak more correctly, alongside of Virgil, the Bible was employed to ascertain the future. In place, however, of throwing lines into a "heathen" urn, it was customary to open the book, as it were accidentally, or to stick a pin between the leaves at hazard, and then open the book—the passage first catching the eye being regarded as pregnant with prophecy as to your future welfare. Such lots drawn from Scripture were called, in the middle ages, *Sortes Biblicæ*, just as those drawn from Virgil were called *Sortes Virgilianæ*. The custom of using (or abusing) the Bible in this grossly superstitious way still lingers in England, Scotland, and other countries, but it is now more a frolic of children than aught else. The poet Hafiz is still so used in Persia.

SORTIE, an outrush of a beleaguered garrison, equivalent to **SALLY** (see **SALLY-PORT**).

SORTILEGE. This superstition of casting lots is one of the oldest known, as it is impossible to determine its age. In ancient literature we have the heroes of Homer praying to the gods and casting lots in Agamemnon's leather cap; and there are many more recent instances in which the fate of thousands has depended upon the number of spots upon a die, or the fall of a few knuckle bones. There were many varieties of sortilege. The Thriæ lots named from the Thriæ, who nursed Apollo, foretold by counters placed in an urn, and the first drawn gave the answer. In the Viales, the bearer went for a walk, bearing the lots, and asked the first boy he met to draw for him. The Prænestine recalls the parlor spelling of to-day, in which the letters of the alphabet were shaken out on to the floor, and the words made gave the omen. Among the Mohammedans a table with a hundred squares was used, on to which, after prayer, the inquirer, with his face averted, put his finger. The letter he touched began his sentence, and every fifth letter from it was taken up to make the words. Then, of course, there were the *Sortes Virgilianæ* (*supra*), in which the book was opened at a venture, and the verse touched taken as the answer in the times of difficulty. Sometimes, like the Bible, the book was pricked for a text, sometimes a knife was slipped in between the pages. Homer was used in a similar way, and so was and is the Koran. Using the Bible as a book of fate was recommended by Nicephorus Gregoras, who suggested that the Psalter was the best book for the trial. The New Testament was, however, usually employed for the purpose. St. Augustine tells us that though he disapproved of such use of the Scriptures for deciding temporal matters, he had always recourse to it in spiritual difficulties.

SORUS. See **FERNS**.

SOSTENU'TO (Ital.), a term used in musical notation to indicate a sustained mode of execution, continuous in respect of tone.

SOTERIOLOGY. See **ATONEMENT**.

SOTHERN, EDWARD ASKEW, 1826-81; b. Liverpool. He was educated for the church, but the stage was more congenial to his tastes. In 1852 he came to the United States, and appeared at the National theatre of Boston in the character of "Dr. Pangloss." He was a stock actor in Barnum's museum, New York, till 1854, when he joined Wallack's

company. In 1858 the character of "Lord Dundreary," in Tom Taylor's comedy, *Our American Cousin*, was assigned to him. He accepted the part with great reluctance, but his drawl, lisp, and peculiar skip made the play a great success, and it ran for 140 consecutive nights. In 1861 he appeared as "Lord Dundreary" in London, and the play was performed 496 nights. In 1864 he appeared as "David Garrick;" in 1874 in the part of "Brother Sam," written for him by John Oxenford. He returned to New York in 1874, played "Dundreary" and "Garrick" at Wallack's theatre, and appeared later in the same parts in all the large cities. In 1878 he was again very popular in the character of "The Crushed Tragedian." His son, Edward Sothorn, has successfully sustained some of his father's rôles, besides appearing in other parts.

SOTTEVILLE-LES-ROUEN, a small t. of France, in the dep. of Seine-Inférieure, 1 m. s. of Rouen; manufactures cotton goods, cordage, and chemical products. Pop. '91, 15,268.

SOU, or **SOL**. See **SOLIDUS**.

SOUARI NUT. See **CARYOCAR**.

SOUBISE, BENJAMIN DE ROHAN, Seigneur de, 1583-1642; the brother of the duc de Rohan; served when young with Maurice of Nassau in Holland. In 1621 he took command of the Protestant forces in Brittany, Anjou, and Poitou. After the capture of St. Jean d'Angely he received the pardon of Louis XIII., but in 1622 was again in the field for the cause of the reformation. Again defeated, he fled to Germany and England; was again pardoned, but, after three years of inaction, seized the isle of Rhé, and after a sea fight fled a second time to England. He sailed with Buckingham and Denbigh to Rochelle, both expeditions proving failures. A third attempt was prevented by the murder of the duke of Buckingham by Felton. The rest of Soubise's life was spent in. England in intrigue against the French monarchy.

SOUBISE, CHARLES DE ROHAN, Prince de, 1715-87; b. France. He served Louis XV. as *aide-de-camp* during all the campaigns from 1744 to 1748, and in the last year was made field marshal. In 1751 he was placed at the head of the Flanders and Hainault government, but was disgracefully defeated by the Prussians at Rosbach in 1757. But he was the favorite of Mme. Pompadour, and was made state minister by Louis. In 1758 he was again placed at the head of the army and defeated the Hessians, Hanoverians, and English at Sondershausen and Sutzenberg. Soubise paid court to Dubarry, the king's new favorite, and even allowed his cousin to marry her nephew. Of all the courtiers, he alone followed the body of Louis XV. to its grave. Under Louis XVI. he retained his position as minister.

SOUDAN. See **SOODAN**.

SOUFFLÉ, a light and agreeable dish, consisting chiefly of the whites of eggs, to which other ingredients (chocolate, cheese, vanilla, orange-flower water, rose-water, various essences, etc.) are added, to give consistency, flavor, and variety. The materials have to be agitated with a whisk until the whole is in a creamy froth; which is then baked in a soufflé-pan, made of such a form as to fit into a dish or proper holder, that can be sent to table, and quickly handed round.

SOUKCHOUM KALE', a sea-port town of Asiatic Russia, in the government of Transcaucasia, on the e. coast of the Black sea. In 1831 a commercial port was established here, which, however, has surrendered its pre-eminence to Poti, a town about 70 m. to the s.e.

SOUL, in the language of spiritualistic philosophers, covers the whole region of mind, and is generally conceived of as a naturally imperishable entity, in relation with the body, but definable, for the most part, only in terms of the complete negation of material attributes. With this the popular conception in the main coincides, though it is less labored and considerably less negative. In its original signification the word appears to have stood for the principle of life both in men and in animals. The modes of conceiving it were various: it was sometimes regarded as the mere harmony of the bodily functions, and sometimes as a distinct entity of highly ethereal nature, and generally supposed to be seated in, or connected with, the blood; but no essential distinction was made between the soul of man and the soul of brutes. Very soon, however, the manifest superiority of man to the lower creation suggested difficulties, which were increased as the thought of an after-life, in a different sense from transmigration, was gradually developed. And in man, the constant war among his members, the opposition of passion and reason, as it began to be observed with the growing habit of introspection, called for some explanation which should apply to humanity only. To meet all such difficulties, a "trichotomy," or three-fold division of the human constitution was assumed, according to which a naturally immortal and rational element was supposed to make part of man, besides the animal soul (always variously conceived) which he shared with the brutes. Between the two distinct elements—the animal and the rational soul—the various mental energies were differently apportioned by different thinkers, according as those energies were thought more or less noble and divine. Without going back upon obscure traditions regarding the beliefs of the early peoples, Plato's views may be cited as amounting to a trichotomy, and in Aristotle there is the

distinct mention of a noetic principle in man by the side of the animal soul. Later Greek schools put forward a similar view; and Philo, the forerunner of the Neoplatonists, even spoke of *the soul of the soul*. Lucretius has the same curious expression, to which corresponds the distinction of Roman writers in general between *animus* and the animal soul, *anima*. The earliest Christian writings occasionally distinguish body, soul, and spirit (*pneuma*). Such a threefold division was unfamiliar to the Jewish mind, which appears to have rested in a kind of dualism, and was removed even from the common Greek philosophical expression, *pneuma* being the word employed by Stoic dualists to describe the fine ethereal nature of the material soul. It is hard to say whether a thoroughgoing trichotomy was meant by the Christian writers, or whether the soul was not merged in either of the extreme elements—the coarse material body, or (as commonly conceived) the finely attenuated but still material spirit. Till about the 4th c., the language of trichotomy prevailed in the Christian writings, but thenceforth the doctrine became suspect, having been specially appropriated by certain heretical sects, and soul and spirit came to be identified in substance, and distinguished only in function. Aquinas, and, later, Calvin, pronounced in favor of the dualistic rendering, after which modern popular expression has been molded, chiefly through the predominant influence of spiritualism since the time of Descartes. This gives prominence to the word soul over spirit, except in religious and purely metaphysical aspects. The successors of Descartes have followed him in calling the single soul at once both rational and sensitive; but in rejecting, almost without exception, his description of the lower animals as mere mechanical automata, they have ignored, without an attempt to explain, the real difficulty that he sought to get rid of, and that the trichotomy sought to meet. The ancient doctrine has been revived in various shapes by Paracelsus, Van Helmont, the anatomist Willis, De Maistre, and others.

The Egyptian doctrine of the soul is one of the most important, as it is the most ancient, for this nation appears to have been the first to declare that the soul was immortal. The genesis of the soul itself, however, is not defined by the monuments, although the existence of a cosmic soul, from which the others proceeded, is mentioned by ancient authors. The following may be gathered from a comparison of the papyri and monuments with the traditions handed down by the classical writers:—The soul itself, once separated from the cosmic or mundane soul, was supposed to undergo numerous transmigrations, passing from one animated body to another till its cycle of existence was fulfilled. The soul was considered to be essentially distinct from the body, and only connected with it through the link of life. It was represented in the hieroglyphs by several signs, as a basket of fire, a heron, a hawk with a human face, and a ram. Its nature was divine, but after death it passed to the great judgment in the hall of the two truths, where it was tried before Osiris and the forty-two assessors or demons of the dead, whose verdict determined its future destiny. This depended upon the sins it had perpetrated during life, and which more or less interfered with its transmigration through the necessary cycle of existence till its ultimate union with the deity, and reception into the Egyptian heaven. In the judgment it was accused by the enemy or accuser; and after the judgment it was either devoured or annihilated, passed to the region of the Egyptian hell, or to the place of the metempsychosis, from which it entered some body of man or animal on the point of entering into existence. The great desire of the dying, indeed was, that his soul should pass off the earth, its detention here preventing its ascent to the moon or heaven. The souls of the wicked passed into the Egyptian hades, which the sun was supposed to traverse during the hours of the night. There they were subjected to punishments of a corporeal rather than spiritual nature—burned in brasiers, plunged into streams, kept in utter darkness, and deprived of the presence of the sun-god, uttering fearful howls and wails in the prisons within which they were confined. After the passing of the great judgment the soul underwent a series of transformations and adventures in the future state. It was justified, as Osiris had been, against the accusations laid to its charge by evil spirits. It assumed the form of a hawk, heron, swallow, and of a snake with a human head—that of the cosmic soul. In the fields of the Aah-en-ru, or Ahlu, the Egyptian Elysium, it sowed and reaped the harvest of gigantic grain which grew in that happy plain. It ascended the *makken*, or mystical bark, and rowed through the winding of the celestial Nile, passed the fiery caldron of the hades, revisited the body, entered the boat of the sun, and passed through different regions of the Egyptian hell, in which the damned were detained, arriving at last at the manifestation to light. To preserve the body, in order that the soul might revisit and probably reanimate it at a future period, not only was it embalmed with the greatest care, but amulets were attached to it which were supposed to have the power of retaining the vital warmth, and of protecting it from destruction or decay. The period after which the soul was supposed to enter again into a human body was 3,000 years, during which it transmigrated through other orders of animated nature. The principal dogmas, indeed, of the soul among these people were its creation or emanation from the cosmic soul, its transmigrations, and its final reception into heaven, where it lived in the boat of the sun, and traversed the liquid ether in company with that luminary. The Pythagorean and Platonic schools seem to have drawn extensively from Egyptian sources in regard to the nature and des-

tiny of the soul. The Brahmanical and Buddhistic notions of the soul have also much in common with the Egyptian. See **BUDDHISM, TRANSMIGRATION**.—Herodot. ii. 23; Plutarch, *De Isid.* c. 29; Hermes, *Clavis*; Prichard, *Egypt. Mythol.*; Rheinisch, *Denkm. in Miramar* (Wien, 1865); Tylor's *Primitive Culture* (1871).

SOULANGES, a co. in w. Quebec, Canada; adjoining Glengarry co., Ottawa, on the w. and bounded s. by the St. Lawrence river; 138 sq. m.; pop. 91, 9608. The surface is undulating and fairly fertile; wheat, oats, rye, potatoes, and dairy products are the staples. Co. seat, Coteau Landing.

SOULE, GIDEON L., 1796–1879, b. Maine, educated at Bowdoin college. He was connected with Phillips Exeter academy for more than 50 years; was for 17 years the associate at that institution of Dr. Benjamin Abbot, its first principal, and was himself principal, 1838–73. The school under his management took a high rank among American fitting schools.

SOULE, JOSHUA, D.D., 1781–1867; b. Maine; licensed to preach in 1798; joined the Methodist conference in 1799; ordained elder in 1802; appointed presiding elder of the Maine district in 1804; chosen book agent and editor of the *Methodist Magazine* in 1816; elected bishop in 1820, but declined; stationed at New York in 1821 and at Baltimore in 1822–23; re-elected and consecrated bishop in 1824; was delegate from the general conference to the British Wesleyan conference in 1842, and afterward traveled in the British islands and France. On the division of the church he adhered to the south, resided in Nashville, Tenn., and made an episcopal tour in California, 1853–54. He was the senior bishop of the Methodist Episcopal church.

SOULÉ, PIERRE, 1802–70; b. Spain; educated at Bordeaux and Toulouse. He took part in a conspiracy against the Bourbons; edited a radical paper; was sentenced to imprisonment for articles reflecting on the ministry; escaped and settled in New Orleans in 1825. There he was admitted to the bar, and soon acquired a large practice. In 1847 he was elected to the U. S. senate to fill a vacancy; re-elected in 1849. He represented extreme southern views, and was prominent in the debates on the compromise measures of 1850. He was appointed minister to Spain in 1853. He wounded Turgot, the French ambassador, in a duel; favored the insurrection in Madrid in 1854; took part in the Ostend conference in the same year, and returned to the United States in 1855. He opposed the secession of Louisiana, was arrested in 1862 for disloyalty and imprisoned. He was released on condition of leaving the country, to which he returned shortly before his death.

SOULIÉ, MELCHIOR FRÉDÉRIC, 1800–47; b. France. He was expelled from the law school in Paris on account of his radicalism. In 1824 he published a volume of poems, *Amours Français*, and in 1828 his drama *Roméo et Juliette* was produced at the Odéon. In 1832 his play *Clotilde* was performed, and in 1836 he wrote a novel, *Diane et Louise*, which proved very successful. Among many other novels, he published *Le Maître d'Ecole*; *Si Jeunesse Savait, si Vieillesse Pouvait*; and *Mémoires du Diable*.

SOULOUQUE. See **FAUSTINUS I.**

SOULS, CURE OF (Lat. *cura animarum*, care of souls), the technical phrase by which the canon law describes the charge which is given to a pastor, no matter of what degree of dignity, over the spiritual concerns of a flock; and the words especially imply the right of administering the sacraments. In this sense the phrase is used to mark an important distinction between two classes of benefices or church livings—"benefices with," and "benefices without," the cure of souls. Of the latter class are canonries, prebends, and the whole class known in the canon law as "simple benefices." Of the former are parochial cures, vicarial cures, and still more the higher charges of archbishop, bishop, etc.

SouLT, NICOLAS-JEAN DE DIEU, Duke of Dalmatia and Marshal of France, the son of a notary, was b. at Saint-Amens-la-Bastide, in the dep. of Tarn, March 29, 1769. In 1785 he enrolled himself as a private in the royal infantry regiment, and so distinguished himself by his steady obedience to discipline, indomitable *sang-froid*, and general intelligence that, in 1792, he became adjutant-major. His behavior at Fleurus gained for him (Oct. 11, 1794) the brevet of general of brigade. From 1794 to 1799 he was employed on the eastern frontier, and in the retreat after the defeat of Stockach (March 25, 1799), his able handling of the rear-guard alone prevented the annihilation of the French army. Appointed general of division (April 21, 1799), and put under Massena, whom he ably seconded in Switzerland and Italy, he was afterward, on the warm recommendation of Massena, appointed by Napoleon to one of the four colonelships of the consular guards, and now became an ardent Napoleonist. This devotion, doubtless, was a great means of his obtaining the bâton of marshal of France; but he most certainly justified his appointment by his brilliant achievements in the subsequent campaign against the Austrians, closed by the battle of Austerlitz, which he decided by piercing the Russian center. He also did good service in the Prussian campaign, and took an important, though not a prominent, part in the Russian campaign of 1806–7,

after which he was appointed governor of Berlin and created duke of Dalmatia. Soult was next placed at the head of the second corps in Spain, pursued the retreating British, attacked them at Coruña, and though repulsed, forced them to leave all their matériel behind. He then conquered Portugal and exercised vice-regal authority over it, but the sudden arrival of Wellesley at Coimbra, and of Beresford at Chaves, made him retreat rapidly to Galicia. In Sept., 1809, he became commander-in-chief in Spain, gained a brilliant victory at Ocana (Nov. 18); and at the commencement of the following year overran and subdued Andalusia, continuing to command in person the southern army. In attempting to succor Badajoz, which he had captured and garrisoned (March 11), he was defeated by Beresford at Albuera (May 16, 1811). After the battle of Salamanca and the advance of the British on Madrid, Soult became thoroughly disgusted at the rejection of his admirable plans for transferring the theater of war to Andalusia, and demanded and obtained his recall; but on the news of Vitoria (q.v.) reaching Napoleon, Soult, whom alone he considered capable of turning the tide of ill-fortune, was, in all haste, restored to the command-in-chief of the army of Spain. Now, however, it was not in Spain, but in France, that the contest had to be waged, and the advantage of numbers, discipline, and prestige were all on the enemy's side; nevertheless, by a system of military tactics which has been universally admired, he completely neutralized the consummate strategy of Wellington, and reduced the campaign, during the seven months it lasted, to a mere trial of strength, the defeats which he sustained at Orthez and Toulouse being due to the superiority of the British soldiers, not of their general. With his usual suppleness of character he became an ardent royalist after the abdication of Napoleon; but on the return of the latter from Elba, he abandoned Louis XVIII. and became maj.gen. of the imperial army. After Waterloo he rallied the army at Laon; and on July 3, at the council of war, coincided with Carnot as to the uselessness of further resistance. To avoid the punishment due to his treachery he published a memoir traducing Napoleon in the basest manner, and lauding the "lawful princes" (i.e., the Bourbons); but in spite of this he was banished and not recalled till May, 1819; although, in the course of a few years more, he was restored to all his former honors, and took an active part in politics and in the development of French industry. In 1838 he was sent as ambassador to England, and, as the great antagonist of Wellington, was received with the utmost enthusiasm. In 1845 he retired from active duty, was honored with the appointment of "marshal general of France," and retired to his residence of Soultberg, where he died, Nov. 26, 1851. In the following year a statue of him, in white marble, was placed in the galleries of Versailles. See Soult's *Mémoires*; also, Napier's *History of the Peninsular War*; Thiers's *Histoire de la Révolution et de l'Empire*; and Salle's *Vie Politique du Maréchal Soult* (1834).

SOUND (Lat. *sonitus*) is the impression produced on the ear (q.v.) by the vibrations of the elastic medium, such as air or water, in which it is plunged. That this is the case is proved, *first*, by the fact that a bell or tuning fork *in vacuo* gives no sound when struck; *second*, by the fact that mere currents, as such (winds, running water, etc.), do not produce the sensation of sound until they are frittered down into vibratory motions by obstacles.

The most untutored ear distinguishes at once between a mere *noise* and a *musical note*. It of course distinguishes a *loud* sound from a faint one. Moreover, it distinguishes musical notes from one another by their shrillness or gravity, or, as it is technically called, their *pitch*. Again, as in the case of vowel-sounds sung to the *same* musical note, or as in the case of different instruments (flute and violin, for instance) playing the same note, it distinguishes something further—which is called the *quality* of the note. It is on the pitch of notes that the theory of music (q.v.) is based, for the quality is only of importance in giving variety, as in orchestral music—or in giving richness of tone in a solo. The most perfect *music*, so far as theory goes, may be executed on the poorest instrument, but it gives little pleasure from the want of richness or quality. In the same way a singer may possess faultless intonation, yet the performance, though *musically* perfect, may, from the harsh quality of the voice, be unpleasant. We intend in the present article to avoid everything connected with music, and have made these remarks to show that there is something in the theory of sound more profound than is contemplated in the theory of music.

The questions we have now to discuss are:

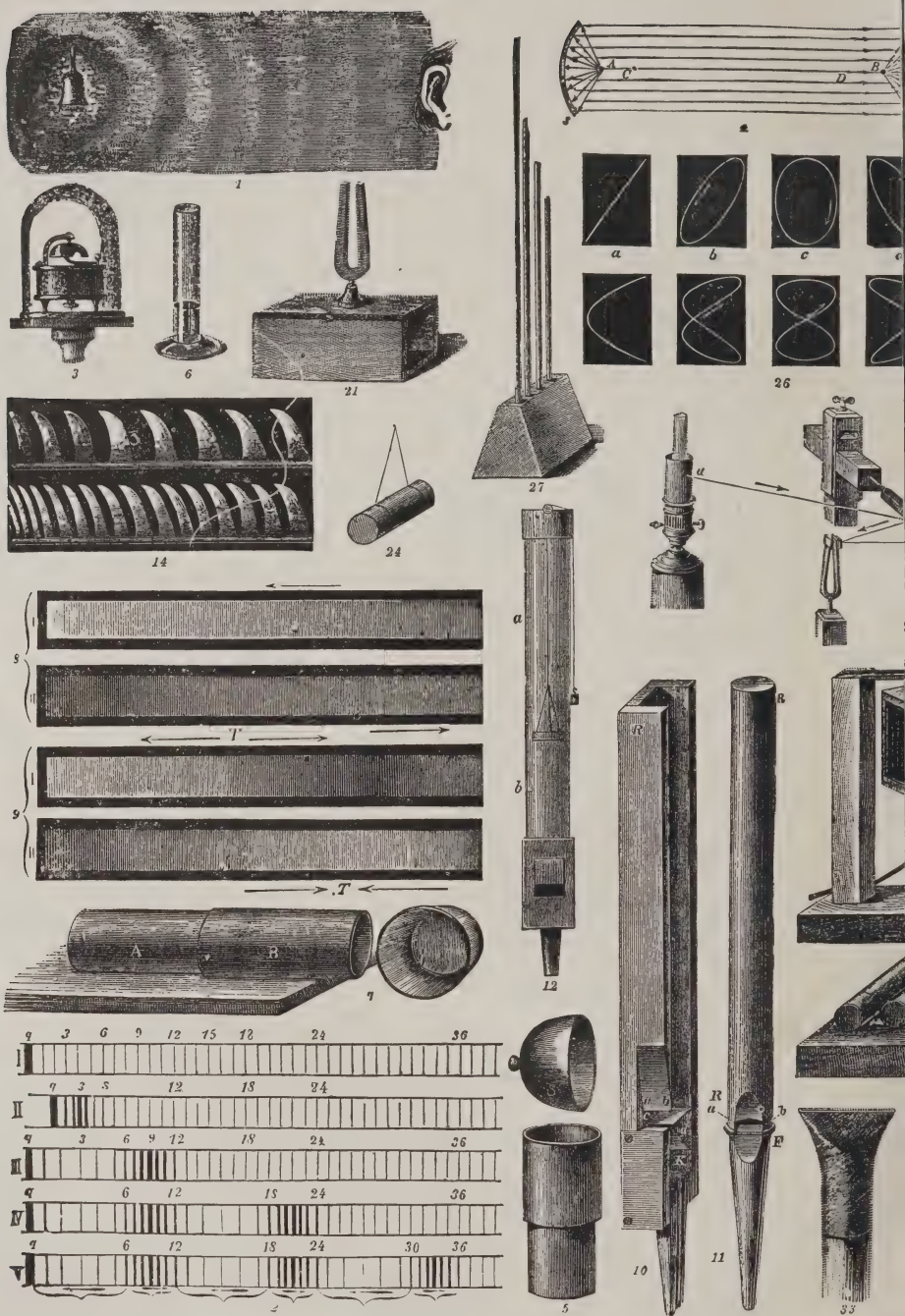
1. What constitutes the difference between a mere noise and a musical note?
2. On what does the pitch of a note depend?
3. On what does its quality depend?

The answers to these queries are all contained in the following statement:

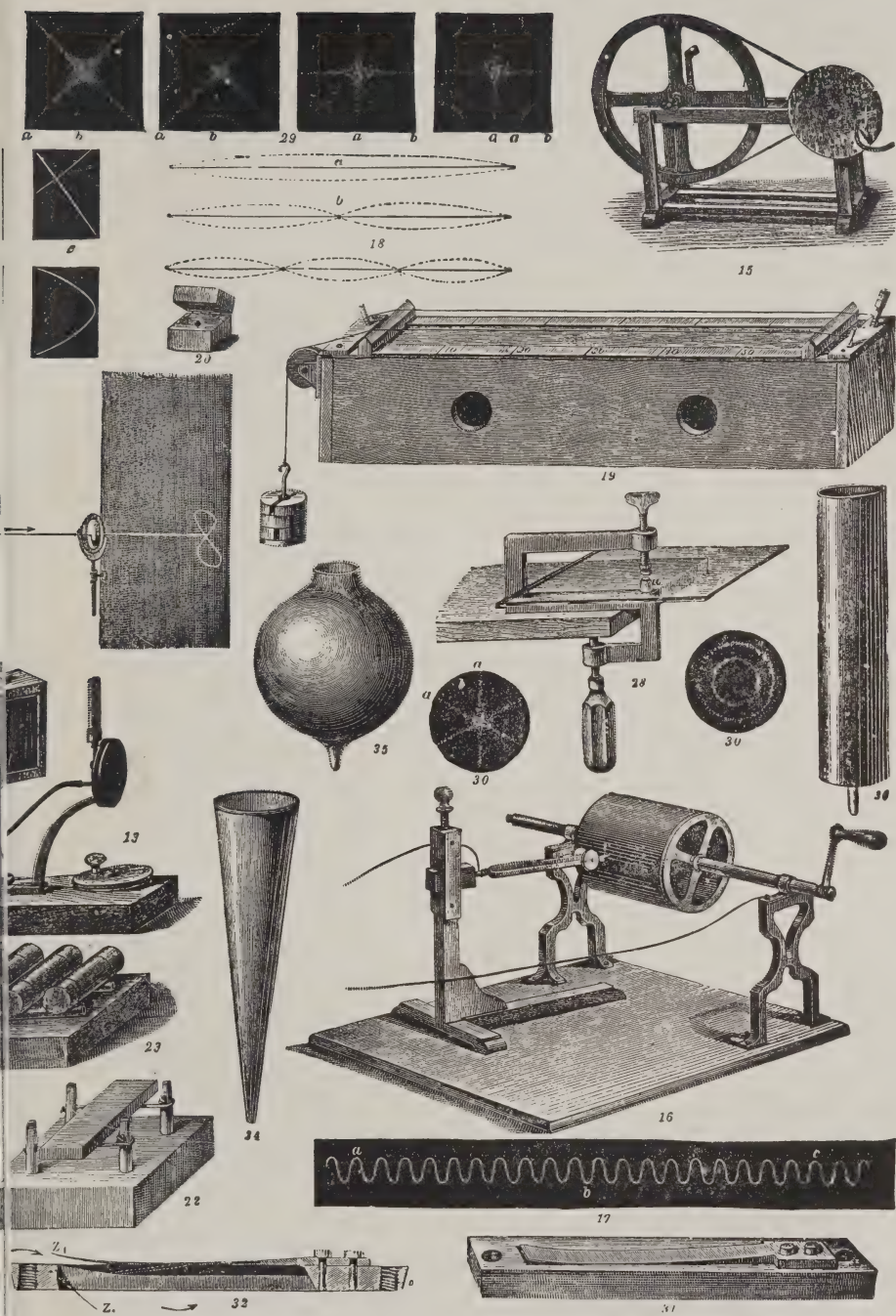
Every musical note consists in the repetition at equal small intervals of time, of some definite noise; the pitch depends on the rate of repetition; and the quality upon the nature of the fundamental noise.

Rough experimental illustrations of the parts of this statement are easily given, more refined ones will be afterward alluded to. If, for instance, the edge of a card be held to a revolving toothed-wheel, a definite noise is produced as each tooth bends the card and allows it to spring back. While the wheel revolves slowly, we can distinguish these suc-

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SOUND.—1-3. Formation and expansion of sound-waves. 4. Reflection of sound-rays. 5-7. Organ-pipes. 12. Vibrating-disk, in tube. 13-14. Manometer and manometric flames. 19, 20. Monochord. 21. Tuning-fork with resonance-chest. 22. Vibrating-body, the manner of recording them. 27. Elastic rods for longitudinal vibrations. 28-30. Vibrating-bodies.



Figures 1-15. Tubes for air-vibrations. 8, 9. Standing vibrations of air-columns in closed tubes. 10, 11. The siren. 16, 17. Phonautograph and recorded tuning-fork vibrations. 18. Vibrating tuning-fork figures. 19, 20. Tubes for determining the limits of sound. 21, 22. Tuning-fork figures and plates. 23, 24. Tubes for determining the limits of sound. 25, 26. Tuning-fork figures and plates. 27, 28. Tongue-work. 29, 30. Membranous-tongue. 31-36. Reflectors.

cessive noises; but when it is revolving so fast that they are no longer separately distinguishable, the character of the sound changes completely. It now becomes continuous, and, so far as the ear can detect, uniform, and thus becomes a musical note (with such an apparatus, not a pleasing one). As the wheel is made to revolve faster and faster, the pitch of the note rises till it becomes a sort of shriek, and finally becomes inaudible. The *sirène* (q.v.) gives another excellent illustration. In this case the fundamental noise is produced by a puff of air escaping from an orifice; and we observe, just as before, that the greater the number of such puffs per second, after they have become so frequent as to be separately undistinguishable, the higher is the pitch of the musical note produced.

Now, if by machinery we arrange matters so that the *sirène* and the toothed-wheel give the number of puffs and the number of impacts on the card the same per second, the musical note produced by each has the same pitch. But the notes differ greatly in quality, the one being exceedingly soft and pleasant, the other harsh and grating. The pitch, therefore, depends on the number of noises per second, and the quality upon the nature of the fundamental noise. We shall find a complete theoretical proof of this later.

The general nature of the mechanical process by which sound is propagated in the air will be illustrated, and compared with other cases of wave-motion, in our article on WAVE. Meanwhile, it is only necessary for us to observe that, as the velocity of sound is ten times greater than that of wind in the most violent hurricane, it is not *air* itself which is transferred from place to place, but a *state of disturbance* (condensation or rarefaction) of the air. Each successive layer of air in the path of the sound suffers this disturbance in turn, and by virtue of its elasticity (q.v.) passes it on to the next.

Newton was the first who attempted to deduce from mechanical principles the velocity of sound, but only for the particular case in which each particle of air in the path of the sound is supposed to move backward and forward according to the same law as the bob of a pendulum (q.v.). He showed that this species of motion is consistent with the elastic properties of air, as given by Boyle's or Mariotte's law (q.v.), viz., that the pressure of air is proportional to its density. The velocity of sound in this case is of course to be found from the time which elapses between the commencement of the motion of any one particle of air, and that of another at a given distance from it, in the direction in which the sound is moving. The numerical result deduced by Newton with the then received experimental data for the compressibility of air, was 979 ft. per second. This investigation was very defective, applying, in fact, solely to the special case of a pure musical note, continually propagated without lateral divergence; yet the solution obtained by Lagrange from a complete analysis of the question, gave precisely the same mathematical result.

But, by direct measurements, carefully made, by observing at night the interval which elapses between the flash and the report of a cannon at a known distance, the velocity of sound has been found to be considerably greater—in fact, about 1090 ft. per second, at the temperature of freezing water.

Newton seeks for the cause of the discrepancy between theory and observation in the idea that the size of the particles of air is finite compared with their mutual distance; and that sound is instantaneously propagated through the particles themselves. Thus, supposing the particles to have a diameter $\frac{1}{8}$ of the distance between them, we must add $\frac{1}{8}$ to the space traveled by sound in a second, i.e., to the velocity—which will thus be brought up to $(1 + \frac{1}{8})$ 979 ft. = 1088 ft. nearly, which is a very close approximation to the actual value given above.

This is not one of Newton's happiest conjectures—for, independent of the fact that such an assumption would limit definitely the amount of compression which air could undergo, and, besides, is quite inconsistent with the truth of Boyle's law for even moderate pressures, it would result from it that sound should travel slower in rarefied, and quicker in condensed air. Now, experiment shows that the velocity of sound is unaffected by the height of the barometer; and, indeed, it is easy to see that this ought to be the case. For in condensed air the pressures are increased proportionally to the increase of condensation, and the mass of a given bulk of air is increased in the same proportion. Hence, in a sound-wave in condensed air, the forces and the masses are increased proportionally, and thus the rate of motion is unaltered. But the temperature of the air *has* an effect on sound, since we know that the elastic force is increased by heat, even when the density is not diminished; and therefore the velocity of sound increases with the temperature at the rate of about $4\frac{1}{2}$ ft. per Fahr. degree, as is found by experiment.

Newton's explanation of the discrepancy between theory and experiment being thus set aside, various suggestions were made to account for it; some, among whom was Euler, imagining that the mathematical methods employed, being only approximate, involved a serious error.

The explanation was finally given by Laplace, and is simple and satisfactory. When air is *suddenly* compressed (as it is by the passage of a sound-wave), it is heated; when suddenly rarefied it is cooled, and this effect is large enough to introduce a serious modification into the mathematical investigations. The effect is in either case to *increase* the forces at work—for, when compressed, and consequently heated, the pressure is greater

than that due to the mere compression—and, when rarefied, and consequently cooled, the pressure is diminished by more than the amount due to the mere rarefaction. When this source of error is removed, the mathematical investigation gives a result as nearly agreeing with that of observation as is consistent with the unavoidable errors of all experimental data. It is to be observed that, in noticing this investigation, nothing has been said as to the pitch or quality of the sound, for these have nothing to do with the velocity. It must, however, be remarked here that, in the mathematical investigation, the compressions and rarefactions are assumed to be very small; i.e., the sound is supposed to be of moderate intensity. It does not follow, therefore, that very violent sounds have the same velocity as moderate ones, and many curious observations made during thunderstorms seem to show that such violent sounds are propagated with a greatly increased velocity. (See a paper by Earnshaw in the *Phil. Mag.* for 1861.) It is recorded that in one of Parry's arctic voyages, during gun-practice, the officer's command 'Fire' was heard at great distances across the ice after the report of the gun.

Since sound consists in a wave-propagation, we should expect to find it exhibit all the ordinary phenomena of waves (q.v.). Thus, for instance, it is *reflected* (see ECHO) according to the same law as light. It is *refracted* in passing from one medium to another of different density or elasticity. This has been proved by concentrating in a focus the feeble sound of the ticking of a watch, and rendering it audible at a considerable distance, by means of a lens of collodion films filled with carbonic acid gas.

Sounds *interfere* to re-enforce each other, or to produce silence; just as the crest of one wave in water may be superposed on the crest of another, or may apparently destroy all motion by filling up its trough. The simplest mode of showing this is to hold near the ear a vibrating tuning-fork and turn it slowly round its axis. In some positions, the sounds from the two branches re-enforce, in others they weaken, each other. But if, while the sound is almost inaudible, an obstacle be interposed between the ear and one of the branches, the sound is heard distinctly. Beats, which will shortly be alluded to, form another excellent instance.

To give an idea of the diminution of loudness or intensity of a sound at a distance from its source, let us consider a series of spherical waves diverging from a point. The *length* of a wave, as we know from the theory, does not alter as it proceeds. (Indeed, as we shall presently see, the pitch of a note depends on the length of the wave; and we know that the pitch is not altered by distance.) Hence, if we consider any one spherical wave, it will increase in radius with the velocity of sound, but its thickness will remain unaltered. The same disturbance is thus constantly transferred to masses of air greater and greater in proportion to the *surface* of the spherical wave, and therefore the amount in a given bulk (say a cubic inch) of air will be inversely proportional to this surface. But the surfaces of spheres (q.v.) are as the squares of their radii—hence the disturbance in a given mass of air, i.e., the loudness of the sound, is inversely as the square of the distance from the source. This follows at once from the law of conservation of energy (see FORCE), if we neglect the portion which is constantly being frittered down into heat by fluid friction. All sounds, even in the open air, much more rapidly in rooms, are extinguished ultimately by conversion into an equivalent of heat. Hence sounds really diminish in intensity at a greater rate than that of the inverse square of the distance; though there are cases on record in which sounds have been heard at distances of nearly 200 miles. But if, as in speaking-tubes and speaking-trumpets, sound be prevented from diverging in spherical waves, the intensity is diminished only by fluid friction, and thus the sound is audible at a much greater distance, but of course it is confined mainly to a particular direction.

As already remarked, the purest sounds are those given by a tuning-fork, which (by the laws of the vibration of elastic solids) vibrates according to the same law as a pendulum, and communicates exactly the same mode of vibration to the air. If two precisely similar tuning-forks be vibrating with equal energy beside each other, we may have either a sound of double the intensity, or anything less, to perfect silence, according to their relative *phases*. If the branches of both be at their greatest elongations simultaneously, we have a doubled intensity—if one be at its widest, and the other at its narrowest, simultaneously, we have silence, for the condensation produced by one is exactly annihilated by the rarefaction produced by the other, and *vice versa*. But if the branches of one be loaded with a little wax, so as to make its oscillations slightly slower, it will gradually fall behind the other in its motion, and we shall have in succession every grade of intensity from the double of either sound to silence. The effect will be a periodic swelling and dying away of the sound, and this period will be longer the more nearly the two forks vibrate in the same time. This phenomenon is called a *beat*, and we see at once from what precedes, that it affords an admirable criterion of a perfect *unison*, that is, of two notes whose pitch is the same. It is easy to see, by the same kind of reasoning, that if two forks have their times of vibration nearly as 1:2, 2:3, etc.—i.e., any simple numerical ratio—there will be greater intervals between the beats according as the exact ratio is more nearly arrived at.

We must now consider, so far as can be done by elementary reasoning, the various simple modes of vibration of a stretched string, such as the cord of a violin. Holding one end of a rope in the hand, the other being fixed to a wall, it is easy (after a little

practice) to throw it into any of the following forms, the whole preserving its shape but rotating round the horizontal line. If the tension of the rope be the same in all these cases, the times of rotation must be inversely as the number of equal segments into which the rope is divided; for the various parts will obviously have the same form; and the masses and distances from the axis of rotation being proportional to their lengths, the centrifugal forces (see CENTRAL FORCES) will be as the squares of the lengths, and inversely as the squares of the times of rotation. But these centrifugal forces are balanced by the components of the tensions at the extremities, in directions perpendicular to the horizontal line; which are, by hypothesis, the same for all the figures. Hence the time of rotation is directly as the length of each segment.

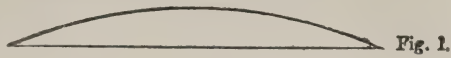


Fig. 1.

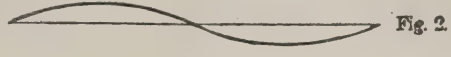


Fig. 2.



Fig. 3.



Fig. 4.



Fig. 5.

Now (see PENDULUM) any such rotation is equivalent to two mutually perpendicular and independent pendulum vibrations of the cord from side to side of the horizontal line. Thus, a violin string may vibrate, according to the pendulum law, in one plane, either as a *whole* (fig. 1), as *two halves* (fig. 2), as *three thirds* (fig. 3), etc.; and the times of vibration are respectively as $1, \frac{1}{2}, \frac{1}{3}, \dots$ Nay, more, any two or more of these may coexist in the same string, and thus, by different modes of bowing, we may obtain very different combinations of simple sounds: a *simple sound* being defined as that produced by a single pendulum motion, such as that of a tuning-fork, or one of the uncomplicated modes of vibration of a string.

The various simple sounds which can be obtained from a string are called *harmonics* of the fundamental note; the latter being the sound given by the string when vibrating as a whole (fig. 1). For each vibration of the fundamental note, the harmonics have two, three, four, &c. Of these, the first is the octave of the fundamental note; the second the twelfth, or the fifth of the octave; the third the double octave; and so on. Thus, if we have a string whose fundamental note is C, the series of simple sounds it is capable of yielding is:

C, C₁, G₁, C₂, E₂, G₂ (B₇), C₃, D₃, E₃, &c.

Of those written, all belong to the ordinary musical scale except the seventh, which is too flat to be used in music. This slight remark shows us at once how purely artificial is the theory of music, founded as it is, not upon a physical, but on a sensuous basis.

To produce any one of these harmonics with ease from a violin string, we have only to touch it lightly at $\frac{1}{2}, \frac{1}{3}, \frac{1}{4}$, &c. of its length from either end and bow as usual. This process is often employed by musicians, and gives a very curious and pleasing effect with the violoncello or the double-bass. The effect of the finger is to reduce to rest the point of the string touched; and thus to make it a point of no vibration, or, as it is technically called, a *node*.

In the case of a pianoforte wire, a blow is given near one end, producing a displacement which runs back and forward along the wire in the time in which the wire would vibrate as a whole. The successive impacts of this wave on the ends of the wire (which are screwed to the sounding-board), are the principal cause of the sound. But more of this case later.

The theory of other musical instruments is quite as simple. Thus, in a flute, or unstopped organ-pipe, the sound is produced by a current of air passing across an orifice at the closed end. This produces a wave which runs along the tube, is reflected at the open end, runs back, and partially intercepts the stream of air for an instant, and so on. Thus the stream of air is intercepted at regular intervals of time, and we have the same result as in the *sirène* (q. v.). In this case, there is *one* node only, viz., at the middle of the pipe. If we blow more sharply, we create two nodes, each distant from an end by $\frac{1}{4}$ of the length of the tube. The interruptions are now twice as frequent, and we have the first harmonic of the fundamental note. And so on, the series of harmonics being the same as for a string. We may easily pass from this to the case of an organ-pipe closed at the upper end. For if, while the open pipe is sounding its fundamental note, a diaphragm be placed at the node, it will not interfere with the motion, *since the air is at rest at a node*. That is, the fundamental note of a closed pipe is the same as that of an open pipe of double the length. By examining the other cases in the same way, we find that the numbers of vibrations in the various notes of a closed pipe are in the proportions 1:3:5:7:&c., the even harmonics being wholly absent.

There is another kind of organ pipe, called a reed pipe, in which a stream of air sets a little spring in vibration so as to open and close, alternately, an opening in the pipe. If the spring naturally vibrates in the time corresponding to any harmonic of the pipe,

that note comes out with singular distinctness from the combination—just as the sound of a tuning-fork is strongly re-enforced by holding it over the mouth-hole of a flute which is fingered for the note of the fork. If the spring and the tube have no vibration in common, the noise produced is intolerably discordant. The oboe, bassoon, and clarinet are mere modifications of the reed-pipe; and so are horns in general, but in them the reed is supplied by the lip of the performer. Thus, a cornet, a trumpet, or a French horn, gives precisely the same series of harmonics as an open pipe.

The statements just made as to the position of the nodes in a vibrating column of air are not strictly accurate, for the note is always found to be somewhat *lower* than that which is calculated from the length of the tube and the velocity of sound. Hopkins showed experimentally that the distance between two nodes is always *greater* than twice the distance from the open end to the nearest node. The mathematical difficulties involved in a complete investigation of the problem were first overcome by Helmholtz in 1859, in an admirable paper published in *Crelle's Journal*. The results are found to be in satisfactory accordance with those previously derived from experiment.

We have now to consider the subject of the quality of musical sounds; and one of its most important branches, what constitutes the distinction between the various vowel-sounds. It had long been recognized that the only possible cause of this distinction between sounds *musically identical* must lie in the nature of the fundamental noise, or, to express it differently, the nature of the periodic motion of each particle of air. But it appears that Helmholtz was the first to enter upon a complete examination of the point, both mathematically and experimentally, and the results he has arrived at form by no means the least remarkable of the contents of his excellent work, *Die Lehre von den Tonempfindungen*, recently published.

It was established by Fourier that any periodic expression whatever may be resolved into the sum of a number of simple harmonic terms, whose periods are, respectively, that of the original expression, its half, its third part, etc. Hence any periodic motion of air (i.e., any musical sound) may be resolved into a series of simple pendulum vibrations (i.e., pure musical sounds, such as those of tuning-forks), the first vibrating once in the given period, the second twice, and so on. These notes are, as we have seen, the several harmonics of the lowest. Hence the quality of a musical sound depends upon the number and loudness of the harmonics by which it is accompanied.

Two experimental methods were employed by Helmholtz, one analytical, the other synthetical. In the first he made use of resonance-cavities fitted to the ear, and giving scarcely any indication of external sounds until one is produced which exactly corresponds in pitch with the note which the cavity itself would yield. With a series of such cavities, tuned to the several harmonics of some definite note, the note was examined when played on various instruments, and when sung to different vowel-sounds. It was thus ascertained which harmonics were in each case present, and to what extent, producing the particular quality of the sound analyzed. The second method was founded on the fact, already noticed, that a tuning-fork gives an almost pure musical sound (i.e., free from harmonics). A series of tuning-forks, giving a note and its harmonics, were so arranged as to be kept constantly in vibration by an electro-magnetic apparatus. Opposite to each was fixed a resonance-cavity exactly tuned to it, and capable of being opened more or less at pleasure. When all the cavities were shut, the sound was scarcely audible; so that by opening them in various ways, any combination of harmonics might be made to accompany the fundamental note. These combinations were varied by trial, until the quality of the resultant sound was brought to represent as nearly as possible that of some vowel. The results of this second series of experiments coincided with those of the first. It appears from these investigations that the German U is the quality of a simple sound, though it is improved by adding faintly the two lowest harmonics; that O depends mainly on the presence of the third harmonic; and so on with the other sounds. It also appears, and it is well known by experience, that different vowel-sounds, to be sung with accuracy, require to be sung to different notes, the proper note being that for which the cavity of the mouth is adapted for the production of the accompanying harmonics which determine the quality of the particular vowel.

In strings and pipes, as we have seen, the higher notes are strictly harmonics of the fundamental note, and therefore the sounds of instruments which depend on these simple elements are peculiarly adapted for music. On the other hand, when, as in masses of metal, etc., the higher notes are not harmonics of the fundamental note, the mixed sound is always more or less jarring and discordant. Such is the case with bells, trumpets, cymbals, triangles, etc.; and, in fact, these sounds are commonly characterized as "metallic." To produce from such instruments a sound as pleasing as possible, they must be so struck that as few as possible of the higher notes are produced, and these as feebly as possible. Thus, for instance, to get the most pleasing sound from a piano-forte wire, it should not be struck at the middle, as in such a case the first, third, fifth, etc., harmonics of the fundamental note will be wanting. If, however, it be struck at about $\frac{1}{4}$ of its length from one end, the harmonics produced will be mainly the first five; and these all belong to the chord of the fundamental note. A valuable recent work is Lord Rayleigh's *Theory of Sound* (2 vols. 1878).

SOUND (A.S. and Ger. *swund*; according to Grimm, for *swund*, from the root of *swim*), a word signifying generally a strait or narrow sea-way, but applied specially to the

strait which leads from the Cattegat into the Baltic sea, between Sweden on the e. and the Danish island of Seeland on the west. It forms the usual passage from the n. to the Baltic Sea, is 40 m. long, and nearly 3 m. broad at its narrowest part, between the towns of Helsingborg and Elsinore. Its entrance is defended by the strong castle and fortress of Kronborg. See **EL SINORE**.

SOUND DUTIES, certain dues formerly payable to the Danish government by all vessels passing the sound or strait separating Sweden from Seeland. These duties originated in an agreement between the king of Denmark and the Hanse Towns in 1348, by which the former undertook to maintain the light-houses in the Cattegat, and the latter to pay duty for them. England became bound to pay duty by a treaty of date 1450, and other countries followed. The Sound duties were abolished on Mar. 14, 1857, by a treaty between Denmark and other powers. A pecuniary compensation of \$16,930,640 (the share contributed by Great Britain being \$5,625,030) was stipulated to be paid to Denmark, which was to be held bound to maintain the light-houses and superintend the pilotage of the sound.

SOUNDING is the act of ascertaining the depth of the water. This is done either for purposes of navigation in piloting a ship among shoals or rocks, for ascertaining her position where the depth and nature of the bottom is previously known, or constructing a chart, etc. It is generally effected by means of a marked line, to which is attached a tapered lead, the bottom or foot of the lead being hollowed to receive some grease or tallow to which a portion of the soil at the bottom of the sea will adhere. Other methods have been devised for ascertaining depth, such as by a rotating fan-wheel, etc., but the first method is that still most generally used for ordinary depths.

SOUNDING, DEEP SEA. Until within a few years past, the term *deep sounding* was understood to be that in which a ship sounded to ascertain her position, and where the depth exceeded that which could be obtained with the lead thrown by the hand, or hand-lead; but the necessities of telegraphic communication across the ocean, by means of cables containing insulated wires, have caused the ocean to be measured at depths which were never before considered necessary, or even practicable.

The act of obtaining a deep-sea sounding may be said to consist of two parts—1. To get the sinkers to the bottom as quickly as possible with the line straight up and down; and 2. To bring a portion of the soil of the bottom, as a proof, to the surface; this necessitates the use of a small but strong line, with heavy sinkers and a detaching apparatus for freeing the sinkers when they reach the bottom, as from the smallness of the line and the great friction of all passing through the water, the strain of bringing the sinkers up would be too great for its strength. It may be stated that there is no difficulty whatever in obtaining a sounding, and regaining the sinker with bottom specimen, up to a depth of 1000 to 1200 fathoms ($1\frac{1}{2}$ m.), by means of a heavy lead fitted with a valved tube (fig. 1); but when the depth exceeds 2000 fathoms the difficulties in obtaining a correct sounding increase in a compound ratio with the depth.

The question of ascertaining the depth of water at sea has been greatly simplified from the old-time methods of lead and line where all hands of the watch on deck were required to be present. The introduction of wire in place of the rope and of self-recording leads have enabled the navigator to find out the depth of water without stopping the speed of his vessel and with the aid of but two or three men. Sir William Thomson has done more than any other one man to bring about the improved state of affairs, and his improved sounding apparatus is the one here given. The wire is coiled on a V-shaped ring which can revolve either with the spindle or independently of it, as may be desired, and when not in use it is kept in a zinc-lined box filled with lime water. When ready for use the frame carrying the coil of wire is clamped in position on top of the zinc-lined box and a brake is applied to govern the speed of the wire as it runs out. When the brake has been put on and the egress of the wire stopped a catch is moved which admits of the free revolving of the drum as it is turned by the handle. To the outer end of the wire a sinker is attached, to the cover of which the *Depth Recorder* is secured by a chain two feet long. When a cast is to be taken the recorder is put inside the sinker and is supported by the pressure of the side springs against the inside of the sinker; the slack chain is put in on top of the recorder. The object of the side springs is to prevent the shock, which the sinker experiences when it strikes the bottom, from affecting the reading of the recorder. When the sinker strikes the bottom, the depth recorder slips down the inside of the sinker and is thus relieved of the sudden shock. As the sinker descends, the increased pressure forces the piston D up into the tube, while the spiral spring pulls the piston back. The amount that the piston is forced up against



the action of the spiral spring depends on the depth. To record the depth the marker *C* is used. As the recorder goes down the marker is pushed along the piston. When the recorder is brought up to the surface of the water the piston comes back to its original position, but the marker remains at its place on the scale to which it was pushed, and shows the depth to which the recorder has been. The depth is read off by the cross wire of the marker. Between each cast the nut *A* should be unscrewed to slacken the valve *B*, and the Recorder should be emptied and the nut screwed up firmly. It takes from a few seconds to a minute for the sinker to reach the bottom from the time it is let go, and from a quarter of a minute to 4 minutes for two men to reel it in if the depth is from 10 fathoms to 100 fathoms. However perfectly free from rust the wire be kept, it will break at a kink under a very moderate pull. Without a kink and preserved from rust with proper care, the wire can scarcely be broken in practice with the machine. The former patterns of this machine had chemical tubes made of glass to be used in ascertaining the depth instead of the depth recorder; a discoloration of the chemical substance measured on a gauge gave the depth.

Many very deep soundings are on record, but the two deepest well-authenticated soundings are among those obtained by *H.M.S. Challenger*. The first was about 80 m. to the northward of the Virgin islands, the depth being 3,875 fathoms, or nearly 4½ miles. Unfortunately, not thinking that so near the islands so great a depth would be found, only 3 cwts. of sinkers were used (the usual quantity for such extreme depths being 4 cwts.); this weight, with a one-inch line, took an hour and twelve minutes to reach the bottom. As the ascertainment of the sinkers reaching the bottom depends on the time intervals, it may be stated that the line let free to run with this weight would take about 43 seconds running out the first 100 fathoms, and the time increases as nearly as possible three seconds for each successive 100 fathoms; so that when the interval is prolonged beyond this rate, the sinker has reached the bottom. On this occasion the last 50 fathoms ran out at the rate of 2 minutes 36 seconds per 100 fathoms. The other was to the n. of New Guinea, where the depth was 4,475 fathoms, or more than 5 miles.

An idea of the average depth of the n. Atlantic ocean may be had from the fact that of 108 soundings obtained by the *Challenger*, 48 were between 1000 and 2,000 fathoms, 56 between 2000 and 3000, while only the other 4 exceeded 3000. See *CHALLENGER EXPEDITION*; *DREDGE*.

SOUND NECK. A village of Pasquotank co., North Carolina, some sixty miles from Norfolk, Va.

SOUND, RECORDING OF. The best-known instrument for producing graphic representations of sound vibrations, and one which has been of great value in the study and analysis of complex sounds, such as speech, is the phonautograph. Scott's phonautograph consists of a revolving cylinder, the surface of which is made capable of receiving tracings from a very weak and delicate stylus by being smoked with a candle.

A fine point or stylus, sometimes a hog's bristle, attached to a piece of bladder stretched across the neck of a funnel, is adjusted so as to rest lightly against the revolving cylinder and scratch a fine line in the layer of smoke as the cylinder revolves. The funnel and bladder are also so placed that every motion imparted to the bristle by sound waves entering the funnel and agitating the membrane is sideways with respect to the straight line traced on the cylinder when the bristle is motionless. In this way the tracing is made irregular with every sound, the line being undulatory and having waves corresponding to and correctly representing every wave composing the sound to be examined.

SOUND, REFRACTION OF. Sound moves in straight lines, in spherical-fronted waves; and any small beam thereof, if unequally retarded or accelerated on either side, bends toward the side of retardation so that the acoustic impulses, always directly radial from the face of the sound wave, vary in their point of available impact, as the "air mirror" of sound turns distorted by disturbance. 1. Sound passing from air into water, or water into air, provides the only example really available, of acoustic refraction by difference of elasticity. Sound, encountering a strong opposition in the density of fluids, and a still greater in solids, yet avails itself of the enormously disproportioned intensity of resilience or elasticity. The waves of sound arising from an explosion under water are conveyed by the water long distances; but when cast off into the air above the explosion, the few and retarded vibrations diverge so enormously at such a height, by reason of the flat reflector of the water at the surface, and the hollow arc of force beneath generated by the explosion, as to become nearly inaudible, with their low velocity. Guns at sea, fired on a horizontal with an energy far stronger than the inertia of the air, reverse this; and with sound waves compressed between the force of the cannon and reflection from the water, transmit their force to a great distance. 2. The refraction of sound through differences of *density* has been shown by a convex lens of carbonic acid inclosed in a collodion film, transferring the ticking of a watch to a focus, where it was heard only on the interposition of the lens. The wave front received a concave form on its entrance, accelerated on its exit at the rim, its lagging center became more concave, the normals converging to a focus, 3. Prof. Stokes in 1857 first suggested the refraction of

sound by varying velocities of *wind*. Of two winds at different levels, the upper, if the faster, will retard an opposing sound wave most, and so elevate the sound focus; if the sound advanced with the wind, the focus would lower, on account of the "drag" of the lower layers. Prof. Henry, in 1865, ignorant of the theory, confirmed the above points, observing the audibility of a sound signal against the wind, heard at a ship's mast-head, and that the cloud shadows exceeded the ground wind in speed. 4. Prof. Reynolds, 1874, showed first the refraction of sound from difference of *temperature*. Since the difference in velocity of sound per second is 1 ft. to 1° Fahr., so when the lower air is warm, the sound beams are tilted up by increased speed below, and when cold, the upper strata bend over and depress the focus; in either case favoring audibility at a distance. Thus is explained the ease of extended hearing in Arctic regions.

SOUP (A.-S. *sup-an*, to sip or sup) is a well-known form of food, obtained either from flesh and vegetables, or from vegetables alone. Before noticing the most important varieties of soup, it is expedient that we should have a clear idea of what soup really is, or, in other words, what relation soup bears to the solid ingredients which enter into its composition. The researches of Liebig have thrown much light upon this point. When finely chopped muscular flesh (or butcher-meat) is lixiviated with cold water, and exposed to pressure, there is left a white fibrous residue consisting of muscular fibers, of connective or areolar tissue, and of vessels and nerves. This lixiviated flesh is of precisely the same quality from whatever animal it is obtained, communicates no flavor to water in which it is boiled, cannot be masticated, and as Liebig observes, "even dogs reject it." When the cold water has taken up all that it is capable of extracting, it is found that it has dissolved from 16 to 24 per cent of the dry chopped flesh. This watery infusion contains all the savory and much of the nutrient matter of the flesh, and is usually of a reddish tint, from the presence of a little of the coloring matter of the blood. On gradually heating it to the boiling-point, it is observed that the albumen of the flesh (varying in amount from 2 to 14 per cent, according as the animal was old or young) separates in nearly colorless flakes when the temperature has risen to 133°, while the coloring-matter of the blood does not coagulate till the temperature rises to 158°. The liquid is now clear, and of a pale yellowish tint; and as it reddens litmus-paper, it must contain a free acid. The infusion of flesh thus prepared has the aromatic taste and all the properties of a soup made by boiling the flesh. When evaporated it becomes dark-colored, and finally brown; and on ceasing to lose weight, there is obtained a brown, somewhat soft mass of "extract of flesh," or "portable soup," amounting to about 12 per cent of the weight of the original flesh, supposed to be dried. "This extract," says Liebig, "is easily soluble in cold water, and when dissolved in about 32 parts of hot water, with the addition of some salt, gives to this water the taste and all the peculiar properties of an excellent soup. The intensity of the flavor of the dry extract of flesh is very great; none of the means employed in the kitchen is comparable to it in point of flavoring power." The soup thus made of the flesh of different animals (as, for example, the ox and the fowl) possesses, along with the general flavor common to all soups, a peculiar taste, which distinctly recalls the smell or taste of the roasted flesh of the animal employed. In order to obtain the strongest and best-flavored soup, chopped flesh should be slowly heated to boiling with an equal weight of water; the boiling should only be continued for a few minutes (for prolonged boiling only gives rise to the formation of gelatine, a substance of no nutrient value, from the connective tissue of the flesh), and the soup should be then strained off from the solid residue. As a matter of economy, it is often desirable that the meat should be left in an eatable state, which is not the case with soup made according to the preceding directions. To attain this end, the joint or mass of flesh should be set on the fire with cold water, which should be gently heated to boiling; the flesh thus undergoes a loss of soluble and savory matter, while the soup becomes richer in them. The thinner the piece of flesh is, the greater is the loss which it experiences. Hence the method of boiling which yields the best soup, gives the dryest, toughest, and most tasteless meat. "The juice of flesh," says Liebig, "contains the food of the muscles; the muscular system is the source of all the manifestations of force in the animal body; and in this sense we may regard the juice of flesh as the proximate condition of the production of force. Soup is the medicine of the convalescent, and as a means of restoring the exhausted strength, it cannot be replaced by any article of the pharmacopœia. Its vivifying and restoring action on the appetite, on the digestive organs, the color, and the general appearances of the sick, is most striking."

Most soups contain an admixture of meat and vegetables in their preparation; but many good soups can be made either entirely without the use of flesh, or with fish in place of flesh. In the former class may be placed pea-soup (which is, however, much improved if a piece of bacon enters into its composition), green-pea soup, carrot-soup, potato-soup, asparagus-soup: while for fish-soup, pike, tench, and eels are specially used. See **Bisque**.

SOUR-SOP, *Anona muricata*, a small tree of the West Indies, which bears a white, pulpy, succulent fruit, similar to the custard-apple, slightly acid in taste, weighing from 2 to 3 lbs., and much relished by the people of the West Indies.

SOUTANE (Ital. *sottana*, Fr. *soutane*, Lat. *talaris*, i.e., *vestis*, "a garment reaching to the ankles"), the name usually given in France and Italy to the outer garment worn in civil life (commonly with a flowing over-dress or robe) by Roman Catholic ecclesiastics, when the strict law of clerical costume is in force; and also ordered to be worn under the priestly robes used in the public ministerial offices of the clergyman. In England it was called cassoock. It is not peculiar to bishops, priests, or even to clerics in holy orders, but may be worn by all who have received even the tonsure (q.v.). Indeed, the council of Trent (*Dic. de Reform.*, sess. 23, c. vi.) declares that no cleric shall be held entitled to the "privilege of clerics" unless he shall wear the soutane. The ordinary material of the soutane is serge or woolen cloth; but it is often of more precious stuffs. The color for the secular clergy is commonly black; but dignitaries wear other colors. Thus, the pope wears a white—cardinals, a red—bishops, a violet—many canons, a blue soutane; and in religious orders and collegiate bodies the color is regulated by special laws, which need not be particularized. Its use, as obligatory, was very general in former times, but it has gradually fallen off since the French revolution. It is but little worn in Germany, even in the southern provinces; and in Italy, except in the former papal states, it is much less universal than it was 30 years since. In all places, however, it is strictly required to be worn under the sacred vestments by a priest administering the sacraments, or otherwise officiating publicly.

SOUTH, ROBERT, D.D., the son of a London merchant, was b. at Hackney in 1633. His earlier education he received at Westminster school, of which Dr. Busby was then master; and in 1651 he became a student at Christ Church, Oxford. In 1655 and 1657 successively he took his degrees of bachelor and master of arts; he was ordained in 1658; and in 1660 he was appointed university orator. In this function he was fortunate enough to please the lord chancellor Clarendon on his installation as chancellor of Oxford, and, in reward of his complimentary periods, South was made his domestic chaplain. In 1663 he took his degree as doctor of divinity; the same year saw him promoted to a prebendary stall at Westminster; and in 1670 he became a canon of Christ Church, Oxford. In 1677 Laurence Hyde, son of the chancellor, being sent to Poland as ambassador, he was accompanied thither by South, who had been his tutor, and was the object of his warm regard. Shortly after his return, the rectory of Islip, in Oxfordshire, was conferred upon him, and he was made chaplain-in-ordinary to Charles II. He might readily now have become a bishop, but through this and the succeeding reign he steadily continued to decline the offers of higher preferment pressed upon him. The designs of James II., tending to a Roman Catholic revival, he regarded with deep disapproval and alarm; but so strong was his sense of the duty of submission to the reigning monarch that he declined all share in the conspiracy to oust him in favor of the prince and princess of Orange. When, however, the revolution was accomplished, he gave in his adhesion to it. But, to his honor, he refused to profit in the way of preferment, by the deprivation of such of the higher dignitaries of the church as could not conscientiously go along with him in recognition of the new order of things. A staunch and even bigoted adherent of the church of England, he continued to wage unsparing war from the pulpit, and with his pen, against Puritanism and every other form of dissent, occasionally occupying himself with discussions more strictly theological, till in July, 1716, death came to conclude his controversies. He is now chiefly remembered by his sermons; they are masterpieces of vigorous sense and sound English, and abound in lively and witty turns, not always in severely decorous consonance with the seriousness of the subject-matter. As a man, South seems to have been of sound and estimable character; of pure life and unblemished integrity. His entire works were sent from the Clarendon press in 7 vols. (1823), 5 vols. (1843). An edition in 2 vols. appeared in London in 1850.

SOUTH AFRICAN REPUBLIC. See TRANSVAAL.

SOUTH AMERICA. See AMERICA.

SOUTHAMPTON, a co. in s.e. Virginia, bordering on North Carolina, and bounded on the e. by Blackwater river, and s.w. by the Meherrin river; crossed by the Seaboard Air line and the Norfolk and Western railroads; drained by Nottaway river; 567 sq. m.; pop. '90, 20,078. The surface is mostly level, and partly covered with forests of cypress and pine, the latter yielding large quantities of tar and turpentine; the soil is sandy. The principal products are wool, corn, oats, and sweet-potatoes; cattle, sheep, and swine are raised. Co. seat, Courtland.

SOUTHAMPTON, a municipal and parliamentary borough, important sea-port, and county of itself, in the s. of Hampshire, 79 m. s.w. of London by the London and South-western railway. It occupies a peninsula at the head of Southampton Water, and between the estuary of the Test or Anton on the w. and s., and the mouth of the Itchen on the east. The High street, which is the principal thoroughfare, extends from the water-side to the Bargate, and thence to the outskirts of the town. Crossing the High street at right angles are many important streets, and handsome lines of new houses are found in the northern and western suburbs. Southampton is furnished with the usual municipal and other institutions common to all thriving towns. St. Michael's church, the oldest in the borough, contains Norman tower arches, and several of the private houses are of Norman architecture. The *Domus Dei*, or God's house, dates from the end of the 12th c., and is one of the earliest hospitals in England. The docks can float the largest steamers and Southampton owes its importance to its sheltered harbor and to the

phenomenon of double tides, which prolong high water for two hours. It is the place of departure and arrival of the West India and Brazil, the Mediterranean, East Indian, China, and Australian, and the South African mail steam-packets. There is considerable traffic between Southampton and the Channel islands and French coast, and also a large cattle-trade with Spain and Portugal. Its harbor is perhaps the most motley and picturesque in England, being frequently crowded with Lascars, Creoles, Arabs, etc., and, on the arrival of mail-steamers, with Indian and American planters, East Indian nabobs, foreign dignitaries, naval officers, and other British and foreign officials in every variety of costume. Its docks, which have recently been greatly extended and improved, include five large dry docks, two tidal basins (16 and 18 acres in area), and a closed dock, and can float the largest steamers. Yacht and ship building and engine-making are actively carried on, and there is an extensive general trade. Southampton is also a fashionable resort in summer. It returns two members to the house of commons. Pop. '81, 60,235; '91, 65,325.

Southampton supplanted the ancient *Clausentum*, which stood one m. to the n.e., and its foundation is ascribed to the Anglo-Saxons. It is called Hamtune and Suth-Hamtun in the Saxon Chronicle. After the conquest Southampton, from which there was ready transit to Normandy, began to prosper rapidly, and in early times it traded with Venice and Bayonne, Bordeaux and Rochelle, Cordova and Tunis. A great part of it was burned by the combined French, Spanish, and Genoese fleets in 1338, and in the following year its defenses were strengthened. Southampton is the birthplace of Isaac Watts (to whom a monument has been erected in the West park), of Thomas Dibdin and of Sir John E. Millais.

SOUTHAMPTON, HENRY WRIOTHESLEY, 3d earl of, 1573-1624; b. England; a friend of the earl of Essex, with whom he went in the expedition to Cadiz and afterward to Ireland. He was convicted, though he strenuously asserted his innocence, of complicity in the treasons of Essex, attainted, and condemned to death; but Elizabeth stayed the latter penalty, and the former was reversed by parliament early in the reign of James I. He was active in the colonization of America, and was governor of the Virginia company. He was imprisoned in the tower in 1621 for his opposition to the arbitrary measures of Charles I.; after his release he commanded a regiment in aid of the Dutch against the Spanish, and both he and his son died of a fever contracted in the Netherlands. He is best remembered as the patron to whom Shakespeare dedicated *Venus and Adonis* and *The Rape of Lucrece*.

SOUTHAMPTON WATER, a fine inlet, stretching n.w. from the point at which the Solent and Spithead unite. It is 11 m. long and about 2 m. wide. The isle of Wight, which intervenes between the Southampton Water and the channel, forms a magnificent natural breakwater, and occasions a second high-water two hours after the first. Southampton Water receives the Test or Anton, Itchen, and Hamble.

SOUTHARD, SAMUEL LEWIS, LL.D., 1787-1842; b. N. J.; educated at the college of New Jersey, and called to the bar. He was appointed associate justice of the New Jersey supreme court in 1815; elected U. S. senator, 1821; appointed secretary of the navy, 1823; was for short periods acting secretary of the treasury and of war; attorney-general of New Jersey in 1829; and governor, 1832. He was again a member of the U. S. senate from 1832 to his death, and president of that body in 1841.

SOUTH AUSTRALIA. Recent legislation has rendered this name a misnomer by extending the boundaries of the colony so as to include the entire center of the Australian continent comprised between the Southern and the Indian oceans, and between the 129th and the 141st degrees of e. long.—an area of 903,690 sq. miles.

Character of the Soil, etc.—The northern portion of this vast territory enjoys an abundant rainfall, and is watered by numerous streams and rivers, some of them, as the Victoria and the Adelaide, navigable for a considerable distance by ships of burden. The soil is fertile, and suitable for the cultivation of tropical productions of every description. In connection with the construction of the overland telegraph across the center of the Australian continent, this region has become better known as being suitable for settlement, already commenced.

The great central region opened up by the explorations of Stuart and McKinlay, and the country to the n. of lat. 33°, may be described as suited only for pastoral purposes on account of the irregularity of the rainfall and the scarcity of permanent water; and with the exception of a few patches along the coast the same description will apply to the country to the westward of gulf St. Vincent, in 138° e. long. The south-eastern division of the colony, comprised between lat. 33° and the Southern ocean, and between gulf St. Vincent and the eastern boundary of the colony, includes every variety of soil, ranging from absolute sterility to the highest degree of fertility, great portion of it being probably unsurpassed by any region in its adaptability both in soil and climate for the growth of wheat, the vine, and the olive. This region is moderately timbered, the principal varieties being the gum, the stringy bark, and the pine, all extremely useful for fencing and building purposes.

Climate.—A country extending over 27° of latitude must necessarily embrace great varieties of temperature; but the climate, owing to prevailing aridity, appears to be, upon the whole, healthy and remarkably free from epidemic diseases. The average annual mortality during 10 years has been found, in the settled districts, to be 15 per 1000 as compared with 22 per 1000 in England. Nearly half of the deaths are those of

children. The hottest months are December, January, February, and March. During these months hot winds occasionally blow. But the same dryness of the air which accounts for the great exaltation of the temperature, renders it more endurable than might at first be supposed, and Europeans are able in the hottest weather to carry on harvest-labor without danger.

Physical Aspect.—The surface of the country alternates between open plains and wooded ranges of moderate elevation, which inclose many beautiful and fertile valleys. The principal ranges are the Flinders range, which trends northward from the e. coast of Spencer gulf to the neighborhood of lake Torrens, in lat. 30°, where it branches out into numerous spurs; and the Mount Lofty range, running nearly parallel with gulf St. Vincent from its head-water in lat. 34° to its termination at cape Jarvis. The Mount Lofty ranges rise to a height of about 2,600 ft., running about n.e. and s.w., having a breadth of over 15 miles. This district abounds in picturesque scenery, the summits being well wooded and the slopes of great beauty and fertility, affording eligible building-sites, and producing in the highest perfection many English fruits and vegetables.

Throughout South Australia the deficiency of running water is remarkable; in fact, for nearly 1200 m., following the indentations of the coast from the western boundary of the colony to the estuary of the Torrens, in gulf St. Vincent, not even a brook of permanent fresh water finds its way into the sea. See AUSTRALIA, VICTORIA.

Divisions, Towns, etc.—The colony naturally falls into three sections—South Australia proper, Central Australia, and the Northern Territory. The 38 counties serve for electoral purposes; the most important division is into districts, of which there were over 100 in 1885. Besides Adelaide, the capital, with its 125,000 inhabitants, there are several townships with over 2000 and many others with more than 1000. Port Adelaide, 7½ m. from the capital, is the chief harbor; but there are several excellent minor ports.

Mineral Wealth, etc.—The mineral wealth of South Australia is great, the principal metals being copper, lead, and iron; the last is of the finest quality, but, in the absence of coal, cannot be profitably worked. The principal copper-mines are the Burra-Burra and the Kapunda, to the n.e. of St. Vincent gulf; the Wallaroo and Moonta, on York's peninsula. Four gold fields were being worked in 1880. Mineral oil and marble have been found.

Government, etc.—There are two houses of parliament, both elective. The whole colony is thrown into one electoral district for electing members to the council on a low property franchise, and for a period of 12 years. Members of the assembly are elected by universal suffrage for 3 years. Voting for both houses is by ballot. The executive government is dependent on parliamentary majorities, as in England. No pecuniary aid is given by government to any religion, and all churches are placed on a footing of perfect equality. The system of public education is modeled on the Irish national system. Attendance is compulsory. Six members of the council retire every four years.

In 1890 the pop. of South Australia amounted to 324,484. In 1881 it was 279,865, besides aborigines numbering about 4000. The imports for 1889 were of the value of £6,804,451; and the exports, £7,259,365. The exports consisted chiefly of corn, wool, and copper. The revenue, derived principally from the sale of crown lands and customs dues, amounted in 1890 to £2,478,981; the expenditure, to £2,404,179; and the public debt, spent in reproductive works, to £20,435,500. The colony has an extensive system of electric telegraphs. An overland line, constructed at the expense of the South Australian government, and opened in 1872, runs from Adelaide to Port Darwin, across Central Australia, a distance of 2000 m., and through junction with the Anglo-Indian line, connects Australia with all the great centres of civilization.

SOUTH BEND, city and co. seat of St. Joseph co., Ind.; on the St. Joseph river and the Chicago and Grand Trunk, the Indiana, Illinois, and Iowa, the Lake Shore and Michigan Southern, the Michigan Central, and the Vandalia line railroads, 88 miles e. of Chicago. It is the seat of the university of Notre Dame and of St. Joseph's and St. Mary's academies (all R. C.), and has a high school, public library, the Catholic reference library of America, several school libraries, Protestant and Roman Catholic hospitals, national and savings banks, building and loan associations, electric lights, electric street railroads, waterworks supplied from artesian wells, over 20 churches, and daily, weekly, and monthly periodicals. The U. S. census in 1890 reported for South Bend, 208 manufacturing establishments, employing a capital of \$11,252,887, and having a combined output valued at \$9,812,513. The city is especially noted for its manufactures of carriages, wagons, agricultural implements, and sewing machines. Pop. '90, 21,819.

SOUTH BETHLEHEM, a borough in Northampton co., Pa., on the Central of New Jersey, the Lehigh Valley, and the Philadelphia and Reading railroads; 57 m. n.w. of Philadelphia. It is the seat of Lehigh university (q. v.), and has St. Luke's hospital, electric lights, electric street railroads, waterworks supplied from the river, national and private banks, and about a dozen churches. The principal industrial plants are the Bethlehem iron works, the Lehigh zinc and iron company, the Bethlehem foundry and machine company, and the Lehigh Valley silk mills. Pop. '90, 10,386.

SOUTHBIDGE, a town in Worcester co., Mass.; on the Quinebaug river and the New York and New England railroad; 20 miles s.w. of Worcester. It contains the villages of Globe, Sandersdale, and Southbridge; was incorporated in 1816; and has manufactories of cotton and woolen goods, spectacles, cutlery, and boots and shoes. Pop. '90, 7655.

SOUTH CAROLINA, a southern Atlantic state, and one of the original 13; between lat. 32° and 35° 13' n.; long. 78° 28' and 83° 18' w.; bounded on the n. and n.e. by N. Carolina; on the s.e. by the ocean; on the s. and s.w. by Georgia, Savannah River separating; extreme length, e. to w., 240 m.; greatest breadth about 210 m.; land area, 30,170 sq. m.; gross area, 30,570 sq. m., or 19,564,800 acres.

HISTORY.—In May, 1562, Ribault, the Huguenot, discovered the harbor of Port Royal, named it, and built Fort Carolina on an island there, but the colonists shortly rebelled and returned to Europe. In 1670, a party of English under William Sayle founded Port Royal, but ten years later removed to the present site of Charleston, the territory at that time being only a part of the Carolina province. Many French Huguenots found their way thither in 1685, and Scotch, Irish, Swiss, and German emigrants followed. Representative government was established as early as 1670. In 1729 the province was divided into North and South Carolina by Charles II., and from that time on it increased in population and prospered, notwithstanding much molestation by the Indians and also by the Spaniards in Florida. During the revolution important battles occurred at Charleston, Fort Moultrie, Camden, King's Mountain, Cowpens, and Eutaw Springs. A state constitution was adopted Mar. 26, 1776, and the constitution of the U. S. was ratified in 1788. From the first the state was prominent in the South. Its wealth increased rapidly, and its political leaders gave it distinction and influence. The most important event in its history for seventy years was brought about by John C. Calhoun, who in 1832, with other leading men of the state, attempted to nullify certain acts of Congress imposing a tariff, believing that it bore unjustly on the interests of the state. During some months this defiance of the national authority threatened future trouble; but prompt measures adopted by President Jackson restored order. The desire to maintain extreme state-rights, however, continued to be prominent in South Carolina politics; and in 1860, when indications of civil war were apparent, it was the first state that seceded from the Union. The legislature met in Charleston, and on Dec. 20 passed an ordinance of secession by a unanimous vote. In April, 1861, the bombardment of Fort Sumter, in Charleston harbor, precipitated the war, and during the next four years the state suffered severely, its harbors either being blockaded or captured one by one, and much of its property being destroyed by federal troops on the great march through the state, under Gen. Sherman. After peace was declared and reconstruction began, a great deal of trouble ensued for several years through the constant disagreement between the whites and the colored people and their leaders. A convention held in Columbia, in Sept., 1865, repealed the ordinance of secession and declared slavery abolished. The state was put under military surveillance; a registration of voters held, which resulted in qualifying 78,982 colored and 46,346 white voters; and a general election followed. The new legislature was largely composed of colored men, and many of the state officers and some of the members of congress were also colored. The constitution, which, after some delay, was framed and accepted, was similar to those required of other Southern States for their re-admittance to the Union. Altogether, South Carolina has had more difficulty in regaining its former prosperity than any of the other former Confederate States except Louisiana.

TOPOGRAPHY.—The Blue Ridge, passing through the northwest part of the state, rises to an elevation (Table Mountain) of 4000 ft. From this a series of terraces descends to what is called the middle country, consisting of low sand-hills. From this region to the coast, from 80 to 100 m., the surface is low and often marshy. The seaboard is about 210 miles in length. Among the many islands are Edisto and Hilton Head. The principal river, the Santee, 150 miles long, is formed by the junction of the Wateree and Congaree, and the latter by the union of the Saluda and Broad. The Great and Little Pedee, Waccamaw, and Black empty into Waccamaw bay; the Cooper and Ashley, into Charleston harbor; the Edisto and Combabee, into St. Helena sound; the Oosawahatchie into Port Royal harbor.

GEOLOGY AND MINERALOGY.—The hilly or upper part of the state is chiefly eozoic, bordered on the southeast by Silurian strata. The level pine lands and coast region are referred to the tertiary and quaternary age, and along some of the rivers are exposed cretaceous areas. Iron ore is abundant in the northwest countries, and at Abbeville and Edgefield, gold is mined. Other minerals are bismuth, silver, zinc, lead, manganese, graphite, kaolin, granite, and building-limestone. The phosphate marl beds of the coast are of great extent and value.

ZOOLOGY AND BOTANY.—Among wild animals, birds, and fowl are the deer, bear, opossum, raccoon, ground-hog, rabbit, squirrel, eagle, buzzard, hawk, turkey, snipe, and grouse. The reptiles include the alligator, tortoise, and about 17 species of serpent; the fish, the sturgeon, shad, herring, and rockfish. The long and the short leaved pine abound, also the black jack, live, scrub, red and post oak, hickory, black walnut, sugar maple, ash, beech, elm, hemlock, cypress, willow, bay, tulip-tree, sycamore, laurel, and especially the palmetto, which figures on the state seal, giving the name of "the Palmetto State" to South Carolina.

CLIMATE, SOIL, AND AGRICULTURE.—The climate in general is mild and even. The mean annual temperature of the mountain region resembles that of New Jersey or Kansas; in the sand-hill region it is from 62° to 50°. The mean annual temperature at Charleston is 65.06°, at Columbia, 62.03°. The yearly rainfall is about 48 inches.

The tide swamp-lands are adapted to rice; the inland swamp-lands to rice, cotton, corn, and peas; the salt marsh-lands to long cotton; the oak and pine-uplands to long cotton, corn, and sweet potatoes; the pine barren, or "middle country," to fruits and vegetables, and the mountain slopes to corn and grains, and the valleys to cotton. The sea islands contain both swamp-lands and up-lands. Cotton and rice are the leading products, but corn, hay, sorghum, potatoes, fruits, and vegetables are more profitable, and the acreage devoted to them is increasing rapidly. Figs, grapes, peaches, plums, pears, pecans, almonds, etc., thrive, and on the coast, oranges and olives. The pitch-pine forests yield rosin and turpentine. The principal cereal productions in the order of value of crops are corn, oats, and wheat. The cotton crop averages about 800,000 bales per annum, and the hay crop exceeds \$2,000,000 in value. Of live-stock, hogs, oxen, cows, mules, sheep, and horses are the most numerous, in their order, the total value averaging about \$17,000,000, agricultural interests have been reduced largely by the development of manufacturing, and many rice-fields have been converted into cattle ranges.

INDUSTRIES.—The water power of the upper and middle cos. is ample, but in the coast region, where the streams flow sluggishly, steam is generally employed. The U. S. census of 1890 reported for South Carolina, 2382 manufacturing establishments, employing \$29,276,261 capital and 24,662 persons, paying \$6,590,983 for wages and \$18,873,666 for materials, and having a combined output valued at \$31,926,681. The principal manufactures are cotton and woolen goods, fertilizers, flour and grist mill products, lumber products, tar and turpentine, and cotton-seed oil and cake. In 1895 there were 62 cotton and woolen mills, with 838,036 spindles and 21,573 looms, and during 1896 charters were granted for 12 new cotton mills and 6 cotton oil mills. The phosphate mining industry, on which the state receives a royalty of \$1 per ton, has been decreasing steadily for several years, owing to valuable finds elsewhere.

COMMERCE.—Charleston, Beaufort, and Georgetown are the ports of entry. Foreign commerce centers mainly at Charleston. The chief articles of export are rice, cotton, phosphates, lumber, naval stores, cotton-seed oil, fish, fruits, and spring vegetables. In the year ending June 30, 1897, the imports of merchandise at the ports of Beaufort and Charleston aggregated in value \$1,101,723; and the exports of merchandise at the three ports, \$14,151,640.

TRANSPORTATION.—The railroads of the state are mostly owned or controlled by three large systems, the Southern, the Seaboard Air line, and the Atlantic Coast line. The total mileage in operation is about 2800; cost of roads and equipment, over \$55,000,000; total investment, over \$57,000,000. The mileage in the state of roads belonging to other states is considerable. The net income of all roads in 1896 was over \$2,300,000; aggregate of railroad taxes paid to the state, over \$300,000 per annum.

BANKS.—In Oct., 1896, there were 15 national banks in operation, with capital \$1,848,000, deposits \$4,294,408, and reserve \$1,047,462; 22 state banks, with capital \$1,392,250, deposits \$1,970,371, and resources \$4,391,447; and 7 stock savings banks, with capital \$439,155, deposits \$4,322,477, and resources \$5,393,707.

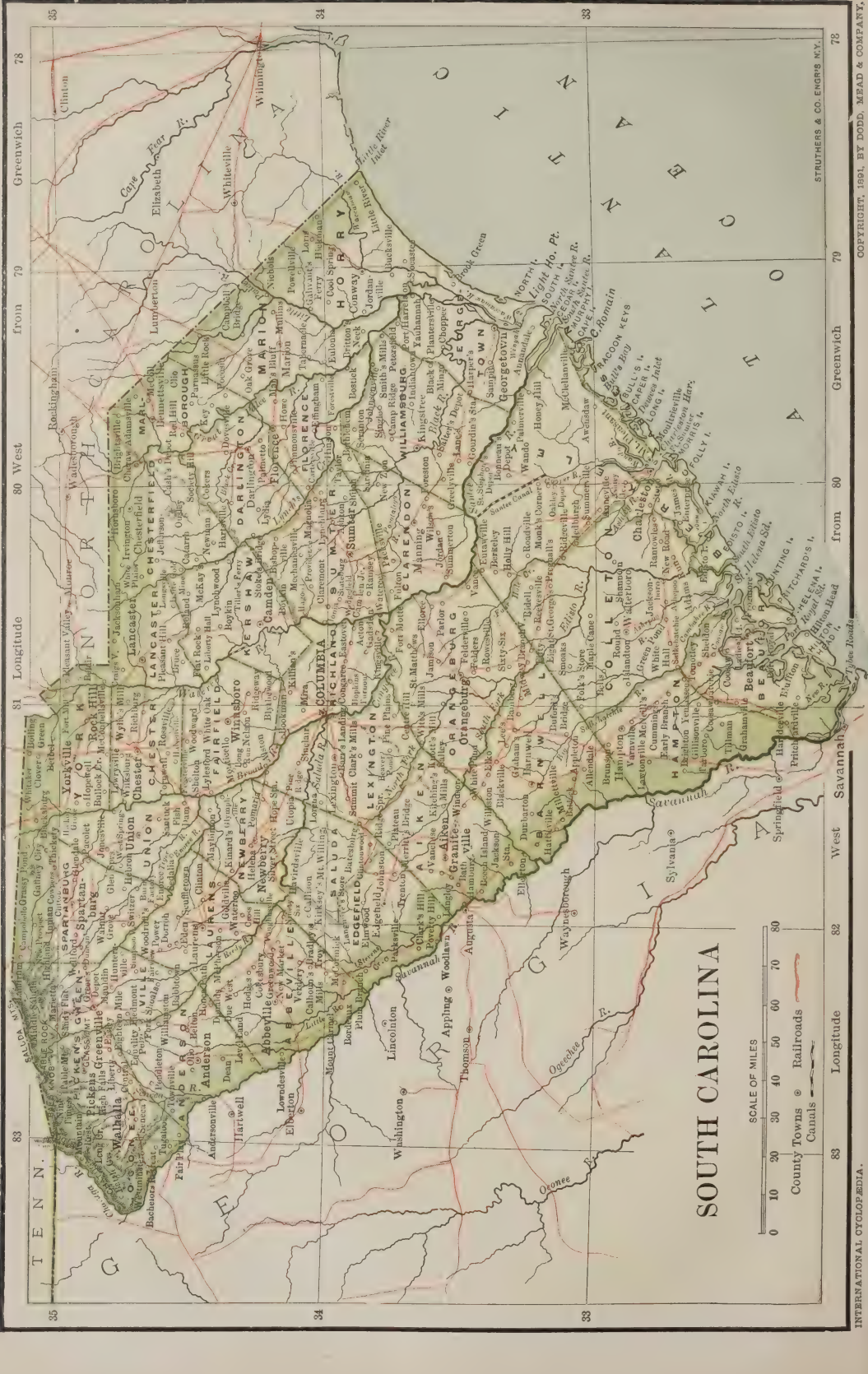
CHURCHES, EDUCATION, ETC.—The leading denominations are the Baptist, Methodist Episcopal South, Methodist Episcopal, Presbyterian, Protestant Episcopal, and Roman Catholic. Free schools were established by the constitution of 1868. In 1895 there were 459,700 persons of school age; the number enrolled was 223,021, and the average attendance, 159,254. The state university comprises South Carolina college, Columbia; South Carolina military academy, Charleston; Clemson agricultural and mechanical college, Clemson college station; and Winthrop normal and industrial college, Columbia. Other advanced institutions include the college of Charleston, Erskine college, Furman university, Newberry college, Claflin university, Allen university, Presbyterian College of South Carolina, Wofford college, several colleges exclusively for women, and numerous normal and industrial schools for white and colored pupils. There is a state medical college at Charleston, and an institution for the deaf and the blind at Cedar Springs. In 1896 there were 32 libraries of 1000 volumes and upward each, with an aggregate of over 230,000 volumes; and about 125 periodicals of all kinds.

GOVERNMENT, ETC.—The capital is Columbia. The constitution of 1868 required as qualifications for suffrage a residence in the state for two years, in the county one year, and in the polling precinct four months; registration; the ability to read or understand the constitution; and the payment six months before an election of any poll tax then due. Under the constitution adopted in 1895, the requirements after Jan. 1, 1898, are that a person applying for registration, if otherwise qualified, must be able both to read and to write any section of the constitution, or show that he owns and has paid all taxes collectable during the previous year on property in the state assessed at \$300 or more. The sessions of the legislature were changed to the second Tuesday in January of each year, with a time limit of 40 days. Common schools are required to be separate and distinct for white and colored children, and pupils of either race are prohibited from attending the schools so set apart for the other race. The supreme court consists of a chief justice and three associate justices, elected by the legislature for eight years each. A bill to introduce the Australian ballot system was defeated in the legislature, but the old ballot law was materially amended. The state dispensary was transferred to a state board of control, but the U. S. supreme court in 1897 declared the entire liquor dispensary legislation void on account of violating the federal constitution. The state pays an annual pension to every indigent or disabled soldier or sailor of the confederacy who is a citizen of the state, and to the indigent widows of confederate soldiers and sailors of the state. The electoral votes have been cast as follows:

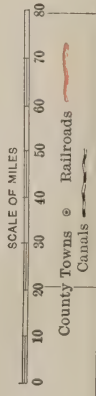
AREA AND POPULATION OF SOUTH CAROLINA BY COUNTIES.

(ELEVENTH CENSUS : 1890.)

	Area in Square Miles.	Population.		Area in Square Miles.	Population.
Abbeville.....	1,006	46,854	Kershaw	775	22,361
Aiken	1,068	31,822	Lancaster.....	535	20,761
Anderson	690	43,696	Laurens	680	31,610
Barnwell	1,214	44,613	Lexington.....	780	22,181
Beaufort.....	967	34,119	Marion	1,024	29,976
Berkeley	1,742	55,428	Marlborough.....	530	23,500
Charleston	193	59,903	Newberry	600	26,434
Chester	570	26,660	Oconee.....	620	18,687
Chesterfield.....	986	18,468	Orangeburg.....	1,400	49,393
Clarendon	664	23,233	Pickens	464	16,389
Colleton	1,920	40,293	Richland	608	36,821
Darlington	673	29,134	Spartanburg.....	949	55,385
Edgefield	1,352	49,259	Sumter.....	870	43,605
Fairfield.....	775	28,599	Union.....	660	25,363
Florence.....	578	25,027	Williamsburg.....	948	27,777
Georgetown.....	742	20,857	York.....	750	38,831
Greenville	716	44,310			
Hampton.....	1,141	20,544	Total.....	30,170	1,151,149
Horry.....	980	19,256			



SOUTH CAROLINA



1788, Washington, 7, vice-president divided; 1792, Washington, 8, vice-president divided; 1796, Jefferson and Pinckney, 8; 1800, Jefferson and Burr, 8; 1804, Jefferson and Clinton, 10; 1808, Madison and Clinton, 10; 1812, Madison and Gerry, 11; 1816, Monroe and Tompkins, 11; 1820, Monroe and Tompkins, 11; 1824, Jackson and Calhoun, 11; 1828, Jackson and Calhoun, 11; 1832, Floyd and Lee, 11; 1836, Mangum and Tyler, 11; 1840, Van Buren and Tazewell, 11; 1844, Polk and Dallas, 9; 1848, Cass and Butler, 9; 1852, Pierce and King, 8; 1856, Buchanan and Breckinridge, 8; 1860, Breckinridge and Lane, 8; 1868, Grant and Colfax, 6; 1872, Grant and Wilson, 7; 1876, Hayes and Wheeler, 7; 1880, Hancock and English, 7; 1884, Cleveland and Hendricks, 9; 1888, Cleveland and Thurman, 9; 1892, Cleveland and Stevenson, 9; 1896, Bryan and Sewall, 9.

The state penitentiary, state hospital for the insane, state orphan asylum, and state institution for the deaf and the blind are at Columbia. The state maintains farms for convict labor, and the counties, almshouses, and jails.

FINANCES.—The funded debt, 1890, was \$6,603,490; receipts, \$1,190,036; expenditures, \$1,112,092; amount raised by taxation, \$723,151; 1896, value of real estate, \$100,976,705; personal property, \$45,838,607; railroad property, \$23,940,162; total taxable property, \$170,755,474; total taxes, \$2,317,889.

POPULATION.—In 1790, 249,073—107,094 slave, 1801 free col'd; 1820, 502,741—258,475 slave, 6826 free col'd; 1840, 594,398—327,038 slave, 8276 free col'd; 1860, 703,708—402,406 slave, 9914 free col'd; 1880, 995,577—604,332 col'd, 131 Indians; foreign born, 7686; male, 490,408; female, 505,169; dwellings, 191,914; families, 202,062; persons to sq. m., 33; engaged in agriculture, 294,602; pop. 1890, 1,151,149. There are 36 cos.; for pop. 1890, see **APPENDIX**, vol. XV. The only cities of large size are Charleston; pop. 1890, 54,955; and Columbia, pop. 15,353.

SOUTHCOTT, JOANNA, a curious specimen of the religious visionary, was b. in Devonshire, England, of humble parentage, about 1750. In her youth she was a domestic servant, chiefly in Exeter; joined the Methodists, and becoming acquainted with a man named Sanderson, who laid claim to the spirit of prophecy, made similar pretensions herself. She received encouragement from some weak-minded clergymen of the church of England. In 1792, she declared herself to be the woman driven into the wilderness, the subject of the prophecy in Rev. xii. She gave forth predictions in prose and verse, and although very illiterate, wrote numerous letters and pamphlets, which as well as her prophecies in verse, or rather in doggerel, were published, and found many purchasers, and many received her pretensions as genuine. One of her productions was the *Book of Wonders*. Thousands of both sexes received them with implicit confidence, among whom were men of good education and respectable position in society. At length she imagined herself to have symptoms of pregnancy, and announced that she was to give birth, at midnight on Oct. 9, 1814, to a second Shiloh, or prince of peace, miraculously conceived, she being then more than 60 years of age. The expected birth did not take place, but on Dec. 27, 1814, the woman died. On a post-mortem examination, it was found that the appearance of pregnancy which had deceived others, and perhaps herself, was due to dropsy.

SOUTH DAKOTA, a north-western state of the American Union, lies between lat. 42° 28' and 46° n.; long. 96° 25' and 104° 5' w., and is bounded on the n. by North Dakota; on the e. by Minnesota and Iowa; on the s. by Nebraska; on the w. by Wyoming and Montana; average length from e. to w., 386 m.; av. breadth, 240 m.; gross area, 77,650 sq. m., or 49,696,000 acres; land surface, 76,850 sq. miles.

HISTORY.—The region now comprising the states of North and South Dakota was included as a whole in Louisiana and Missouri territories successively, and afterwards was divided among the territories of Michigan, Wisconsin, and Iowa. As early as 1827, trading houses were erected on the Dakota river, and in 1829, Pierre Choteau, of St. Louis, built Ft. Pierre not far from the present site of the city of Pierre. In 1849, eastern Dakota was made part of Minnesota territory, and Dakota, west of the Missouri and White Earth rivers, was known as Mandan territory until May 30, 1854, when Nebraska territory was formed, of which it became a part. After the formation of the state of Minnesota, Dakota had neither legal name nor existence, but in 1861, Mar. 2, a temporary government was provided, and Yankton was made the capital. The first legislature met on Mar. 17, 1862. Settlements were made in 1856 at Sioux Falls, and in 1859 at Yankton, but immigration was delayed by Indian outbreaks in 1858 and 1862. In 1863, Idaho (with Montana), and in 1868, Wyoming, were set off. In 1883, Sept. 4, a convention at Sioux Falls framed a constitution for the people south of the 46th parallel, which was adopted in Nov., and under it state officers and members of Congress were chosen, but the constitution never went into effect. In 1885, Sept. 8, a constitutional convention for South Dakota met at Sioux Falls, and on Nov. 3 the constitution framed was adopted. A governor was elected under it, and Huron was selected as the temporary capital. In 1887, Nov. 8, at a special election, and in 1888, July 10, 11, at a general convention, the people voted in favor of a division of Dakota territory. In 1889, Feb. 22, an "omnibus bill," admitting the Dakotas, together with Washington and Montana, was approved by the president. On May 14, the Sioux Falls constitution was adopted, and on Oct. 1 was ratified, state officers, members of the legislature, and congressional representatives being chosen. On Nov. 3, the state of South Dakota was admitted to the Union.

TOPOGRAPHY.—The Missouri river, flowing south and southeast, divides the state into nearly equal portions. East of that river the surface is chiefly a vast plain, including the "great plateau" of the Missouri, and a somewhat similar plateau east of the James river. The Wessington and Ree hills in Hand co., and the Bijou hills in Brule Co. are prominent elevations. West of the Missouri the surface is more broken, and the Black hills have an average elevation of nearly 6000 ft. The total area of the Black hills is about 3200 sq.m., and the highest elevation, Harney's peak, is 7368 ft. above the sea. The principal rivers east of the Missouri are the Dakota or James, which has its source in North Dakota, and joins the Missouri below Yankton, and the Big Sioux, which rises in the state, forms a part of the eastern boundary, and empties into the Missouri at the extreme south-eastern point of the state. The chief streams west of the Missouri, and all tributary to it, are the Grand, Moreau, Cheyenne, and White. Lakes are numerous. Big Stone and Traverse lakes, each about 25 m. long, form part of the northeast boundary. The hot springs of Fall River co., in the Black hills, are widely famed, and there are sulphur springs in Jerauld co. Artesian wells of great depth and pressure are common in the eastern cos. The bad lands (q.v.) are of extraordinary interest to the tourist and artist.

GEOLOGY AND MINERALOGY.—The Black hills consist of a central mass of granite, around which are arranged, concentrically, rocks of the archæan, cambrian (Potsdam), carboniferous, triassic, jurassic, cretaceous, and tertiary periods. It is believed that the Dakotas "lay in the path of a great continental glacier," and that the deep deposits of gravel, sand, and clay, of the eastern plains, were brought down from the eroded mts. lying to the north. During the post-glacial period, Dakota is believed to have been covered by a vast inland sea, into which the Missouri and other streams poured sediments from the cretaceous and tertiary rocks pulverized by the glaciers of the north. The river valleys were cut out by erosion, and the effects of this mighty force are seen at altitudes of several thousand ft. in the Black hills. The Black hills constitute one of the richest mineral regions of the United States. Quartz gold is found throughout the archæan rocks, but mainly in the north, where Deadwood and Lead City are important mining centres. Placer gold is found in the beds of all the streams in the archæan area, and both gold and silver are obtained from the Potsdam rocks of the northern hills. Tin, which is found in three counties, was discovered in 1893. The mines are numerous, and among important centres are Spearfish and Custer. Mica is mined with the tin. The archæan and Potsdam rocks yield copper. Among other products of this remarkable region are antimony, arsenic, asbestos, cobalt, fire and pottery clays, gypsum, graphite, iron, lead, nickel, building limestone, porphyry, salt, saltpeter, sandstone and zinc. The greater part of the state, west of the Missouri, is underlaid with a deposit of lignite coal of excellent quality. Clay, suitable for brick and terra-cotta, abounds everywhere. At Sioux Falls, Dell Rapids, and elsewhere in the southeast, there are extensive quarries of beautiful quartzite or jasper. Oil has been found in the Black hills, and natural gas in the same section, as well as in the Missouri and Dakota river valleys.

ZOOLOGY AND BOTANY.—The wild animals, birds, etc., are those found in Minnesota and other adjoining states. The Black hills derive their name from the dense and dark forests of yellow pine which formerly covered them, and here, too, are found on the slopes and in the valleys, the black and white spruce, burr oak and white elm, with, more sparingly, the aspen, white birch, ash, mulberry, ironwood, juniper, sumach, hazel, and box elder. Along the Missouri and its tributary streams grow the cottonwood, ash, willow, etc. Wild fruits grow in great profusion, the plum, grape, raspberry, strawberry, choke cherry, buffalo berry, etc. Rich grasses cover the prairies of the east, and the Black hills and Bad Lands offer equal inducements to the stock-raiser and dairy farmer.

CLIMATE, SOIL, AND AGRICULTURE.—The atmosphere is dry and free from humidity. The winters are cold but invigorating, and less snow falls than in states south and east. The winters break suddenly, usually in Mar., and seeding and farm planting generally begin in the latter part of the month. Summer time is marked by warm days and cool nights. The mean annual temperature at Deadwood is 42.1°; at Fort Sully, 45°. The soil is a light but rich loam, overlying a fertile clay subsoil. Corn, oats, barley, buckwheat, rye, flax, hops, potatoes, alfalfa, and millet are among the farm products. The grains are cultivated with great success, and attain a size and solidity of berry elsewhere unknown. The adaption of the soil and climate to the growing of all cereals is manifested in the perfection of the grain and the large yield of the crops. Apples, plums, grapes, strawberries, currants, gooseberries, are raised successfully. The quality and quantity of the yield of vegetables of all kinds are remarkable.

MANUFACTURES.—The U. S. census of 1890 reported for South Dakota, 499 manufacturing establishments, employing \$3,207,796 capital and 2,422 persons, paying \$1,098,418 for wages and \$3,523,840 for materials, and having a combined output valued at \$5,682,748. The principal manufactures are flour and grist mill products, lumber products, brick and tile, and dairy products. There are valuable granite, sandstone, and limestone quarries. The estimated output of the Black hills region in 1896 was gold, \$8,240,000, silver and copper, \$1,260,000.

BANKS.—In Oct., 1896, there were 30 national banks in operation, with capital, \$1,960,000, and deposits, \$4,000,345; 80 state banks with capital, \$1,042,110, and deposits, \$1,884,501; and 70 private banks with capital, \$1,144,592, and deposits, \$1,469,408.

AREA AND POPULATION OF NORTH DAKOTA BY COUNTIES.

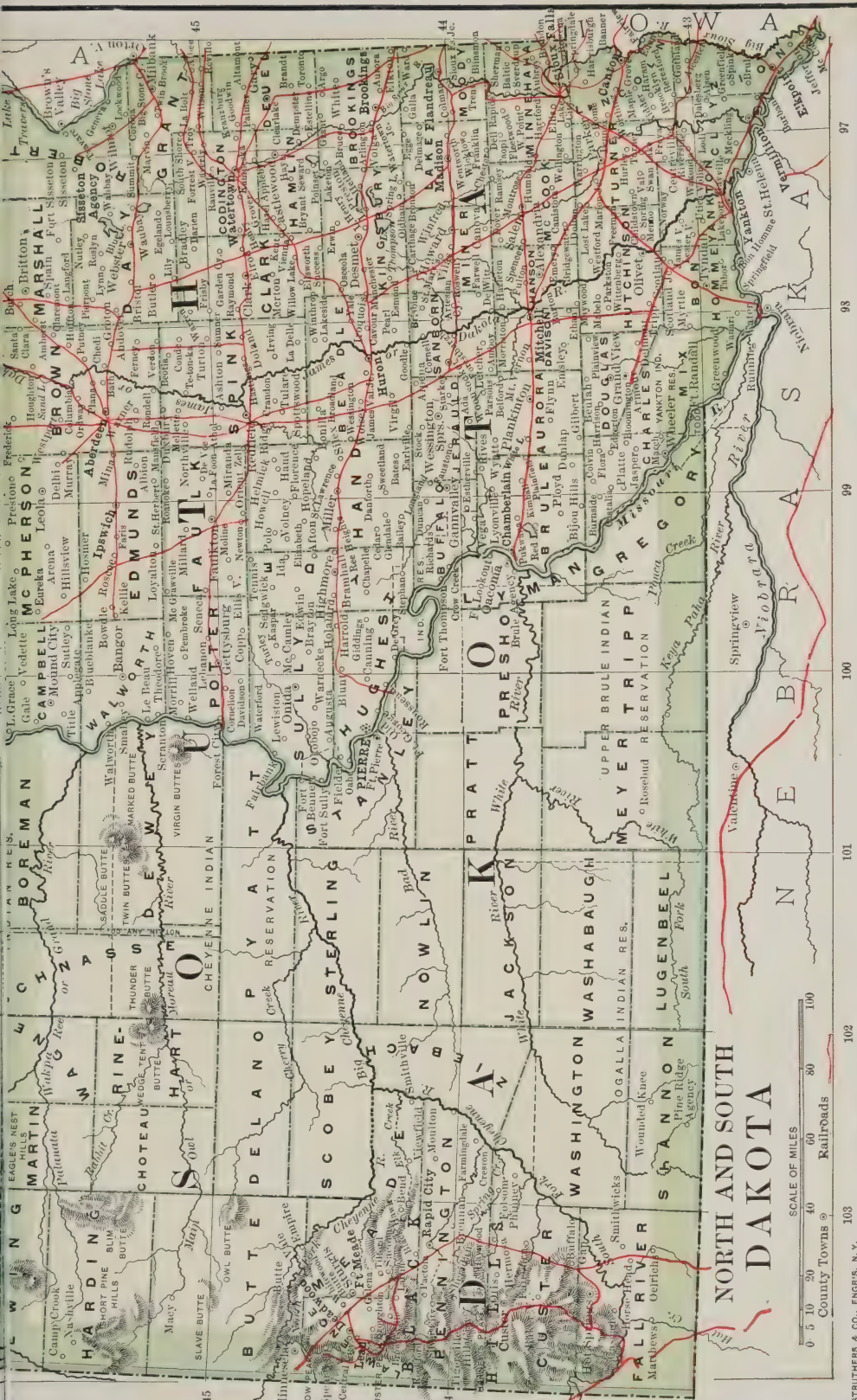
(ELEVENTH CENSUS : 1890.)

	Area in Square Miles.	Population.		Area in Square Miles.	Population.
*Allred.....	450	.....	Mercer.....	711	428
Barnes.....	1,512	7,045	Morton.....	3,168	4,728
Benson.....	1,368	2,460	†Mountraille.....	2,895	122
Billings.....	3,360	170	Nelson.....	1,008	4,293
Bottineau.....	1,130	2,893	Oliver.....	720	464
Bowman.....	1,224	6	Pembina.....	1,120	14,334
†Buford.....	1,620	803	Pierce.....	864	905
Burleigh.....	1,692	4,247	Ramsey.....	936	4,418
Cass.....	1,764	19,613	Ransom.....	864	5,393
Cavalier.....	1,512	6,471	†Renville.....	1,332	99
*†Church.....	1,020	74	Richland.....	1,440	10,751
Dickev.....	1,152	5,573	Rolette.....	936	2,427
Dunn.....	1,152	159	Sargent.....	864	5,076
Eddy.....	648	1,377	*†Sheridan.....	900	5
Emmons.....	1,584	1,971	Stark.....	1,310	2,304
†Flannery.....	1,800	72	Steele.....	720	3,777
Foster.....	648	1,210	†Stevens.....	1,116	16
†Garfield.....	918	33	Stutsman.....	2,304	5,266
Grand Forks.....	1,404	18,357	Towner.....	1,044	1,450
Griggs.....	720	2,817	Traill.....	864	10,217
Hettinger.....	2,160	81	Wallace.....	1,323	24
Kidder.....	1,440	1,211	Walsh.....	1,584	16,587
La Moure.....	1,152	3,187	†Ward.....	1,512	1,681
Logan.....	1,008	597	Wells.....	1,296	1,212
†McHenry.....	1,476	1,584	†Williams.....	1,260	109
McIntosh.....	1,008	3,248	Unorganized territory.	1,400	511
McKenzie.....	1,080	3			
†McLean.....	702	860	Total.....	70,195	182,719

* No population.

† Since 1890, the counties of Buford, Church, Flannery, Garfield, Mountraille, Renville, Sheridan, and Stevens have been disorganized, and the territory added to the counties of Williams, Ward, McLearn, and McHenry.





NORTH AND SOUTH DAKOTA

SCALE OF MILES
0 5 10 20 40 60 80 100
County Towns Railroads

STURTESS & CO., ENGRS., N. Y.

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AREA AND POPULATION OF SOUTH DAKOTA BY COUNTIES.

(ELEVENTH CENSUS. 1890.)

	Area in Square Miles.	Population.		Area in Square Miles.	Population.
Aurora.....	725	5,045	Lincoln.....	540	9,143
Beadle.....	1,235	9,586	*Lungenbeel.....	1,080	.....
Bon Homme.....	540	9,057	Lyman.....	575	233
*Boreman.....	1,260	.....	McCook.....	580	6,448
Brookings.....	795	10,132	McPherson.....	975	5,940
Brown.....	1,720	16,855	Marshall.....	900	4,544
Brulé.....	825	6,737	Martin.....	755	7
Buffalo.....	510	993	Meade.....	1,405	4,640
Butte.....	2,335	1,037	*Meyer.....	1,440	.....
Campbell.....	900	3,510	Miner.....	580	5,165
Charles Mix.....	1,130	4,178	Minnehaha.....	790	21,879
Choteau.....	870	8	Moody.....	500	5,941
Clark.....	970	6,728	Nowlin.....	1,220	149
Clay.....	410	7,509	Pennington.....	1,521	6,540
Codington.....	720	7,037	Potter.....	900	2,910
Custer.....	1,615	4,891	Pratt.....	1,220	23
Davison.....	435	5,449	Presho.....	1,185	181
Day.....	1,080	9,168	Pyatt.....	1,510	34
Delano.....	1,045	40	*Rinehart.....	835	.....
Deuel.....	630	4,574	Roberts.....	1,100	1,997
*Dewey.....	2,235	.....	Sanborn.....	580	4,610
Douglas.....	450	4,600	Schnasse.....	1,580	.....
Edmunds.....	1,155	4,399	Scobey.....	1,045	32
Ewing.....	1,008	16	*Shannon.....	1,080	.....
Fall River.....	1,770	4,478	Spink.....	1,505	10,581
Faulk.....	1,010	4,062	Stanley.....	1,155	1,028
Grant.....	690	6,814	Sterling.....	1,185	96
Gregory.....	975	295	Sully.....	1,050	2,412
Hamlin.....	545	4,625	Todd.....	45	188
Hand.....	1,435	6,546	*Tripp.....	1,800	.....
Hanson.....	435	4,267	Turner.....	615	10,256
Harding.....	1,475	167	Union.....	430	9,130
Hughes.....	756	5,044	Wagner.....	720	.....
Hutchinson.....	795	10,469	Walworth.....	740	2,153
Hyde.....	850	1,860	*Washabaugh.....	1,260	.....
Jackson.....	1,255	30	Washington.....	1,510	40
Jerauld.....	550	3,605	Yankton.....	515	10,444
Kingsbury.....	870	8,562	Ziebach.....	1,040	510
Lake.....	580	7,508			
Lawrence.....	795	11,673	Total.....	76,850	328,808

* No population.

RAILROADS.—The state is well equipped with railroads, being crossed by several great trunk systems, and having a large number of local roads. The length of trunk and local lines exceeds 2800 miles.

RELIGIOUS DENOMINATIONS, EDUCATION, ETC.—The leading denominations numerically are the Methodist Episcopal, Congregational, Presbyterian, Baptist, Roman Catholic, and Protestant Episcopal. There are about 105,000 children of school age in the state, over 3600 public school-houses, public school property valued at \$3,500,000, and a permanent school fund of over \$2,000,000. The higher institutions are the State university, Vermilion; agricultural and mechanical college and experiment station, both at Brookings; school of mines, Rapid City; normal schools at Madison, Springfield, and Spearfish; Sioux Falls univ. (Bap.); Yankton college (Cong.); Redfield college (Cong.); Dakota university (M. E.), Mitchell; Pierre univ. (Presb.), East Pierre; Black Hills college (M. E.), Hot Springs; All Saints' school (P. E.), Sioux City; convent and school of the Sacred Heart (R. C.), Yankton; and Augustana (Luth.) college, Canton.

GOVERNMENT, ETC.—The capital is Pierre. The Sioux Falls constitution provides that the total aggregate debt of the state, with all previous debts, shall never exceed \$500,000; that the house of representatives shall consist of not less than 75 nor more than 135 members, and that the number of members of the senate shall not be less than 25 nor more than 45. The sessions shall be biennial, and the legislature first chosen shall consist of 33 senators and 99 representatives. No person convicted of an infamous crime, no defaulter for public moneys, and, with minor exceptions, no person holding a lucrative office under the state, the United States, or any foreign government, can be elected to the legislature. The terms of office of members shall be two years; they shall receive \$5 for each day's attendance and 10 cts. for every mile of necessary travel. Except in cases of impeachment, sessions shall not exceed 60 days. The executive power is vested in a governor and lieutenant-governor, elected for two years, the latter being, *ex-officio*, pres. of the senate. The governor has a veto power on legislation, which may be overridden by a two-thirds vote of both houses. He may veto items of an appropriation bill and approve the rest. The other officers are a sec. of state, auditor, treasurer, supt. of instruction, commissioner of school and public lands, and attorney-gen., severally holding office for two years. The supreme court consists of three judges, elected from districts, with appellate and supervisory jurisdiction only, and elected for four years; subsequently the number may be increased, and the term is to be six years. The circuit courts, six in number, are the courts of general original jurisdiction. There are also co. courts, justices of the peace, and special courts for cities and incorporated towns. A residence of one year in the United States, six months in the state, thirty days in the county, and ten days in the election precinct is required of voters. The legislature may not pass special legislation laws. Corporate powers are restricted, and the right of the state over them is maintained. All property acquired by a woman before marriage is inalienably hers, as well as all to which she is rightfully entitled after marriage. A state prohibition law was adopted in 1891, contested, and affirmed. The electoral votes of the state have been cast as follows: 1892, Harrison and Reed, 4; 1896, Bryan and Sewall, 4.

The bonded indebtedness of the state in 1896 was \$1,085,960; its assessed valuation, over \$119,000,000. The state institutions include a penitentiary and a school for deaf-mutes at Sioux Falls, a hospital for the insane at Yankton, a state industrial school at Plankinton, and a soldiers' home at Hot Springs.

POPULATION.—In 1885 this was est. at 260,721; in 1890 it was 328,808. The foreign pop. is largely Scandinavian and German. The Indians numbered 19,068 in 1890. There are 52 organized cos. In 1890 the only city having a population exceeding 10,000 was Sioux Falls, 10,177. Other important places are Aberdeen, Pierre, Rapid City, Huron, Watertown, Yankton, Deadwood, and Mitchell.

SOUTHERN, THOMAS, 1660–1746; b. Ireland; educated at Trinity College, Dublin; entered at the Middle Temple, but abandoned law for dramatic literature, and became a popular writer of plays. His principal tragedies were the *Persian Princess*; *Isabella, or the Fatal Marriage*; *Oroonoko*; and comedies, *The Disappointment*; *The Rambling Lady*; *The Wives' Excuse*. He is said to have been the first English writer who denounced the slave-trade in *Oroonoko*. A collection of his plays with a memoir was published in 1774 in 3 vols.

SOUTHERN CROSS, THE, a constellation near the South Pole in the zone of the milky way. See **GALAXY**. Of its four principal stars, one, the southernmost, is of the first magnitude; two, the eastern and northern, of the second; and one, the western, of the third. All of these, except the northern, are white; this is a pale orange. A fifth star of the fourth magnitude is described by Sir John Herschel as a "most intense red."

SOUTHEY, CAROLINE ANN BOWLES, English author, was born at Lymington, Hants, in 1786, and was the only child of Capt. Charles Bowles, a retired officer. Reverses obliging her to earn her living, she decided to try literature, and about 1820 sent to Southey, the poet, a narrative poem, *Ellen Fitzarthur*, subsequently published. The correspondence that ensued led to a friendship, and to their marriage in 1839. Her health, already frail, was much impaired by her devotion to her unfortunate husband, but she survived him, dying in 1854. Her works include, *The Widow's Tale and other Poems* (1822); *Solitary*

Hours (prose and verse), 1826; *Tales of the Moors* (1828); *Chapters on Churchyards*, considered her best work (1829); *Tales of the Factories* (1833); *Selwyn in Search of a Daughter* (1835); *The Birthday* (1836); and *Robin Hood*, written in conjunction with her husband, but never published. See *Southey's Correspondence with Caroline Bowles*, edited by Prof. Dowden.

SOUTHEY, ROBERT, was b. Aug. 13, 1774, at Bristol, in which city his father was a linen-draper. In 1788 he was sent to Westminster school by his maternal uncle, the Rev. Herbert Hill, chaplain to the English factory at Lisbon, who undertook the charge of his education, his father's pecuniary affairs having become much embarrassed. At Westminster he much distinguished himself; but in 1792 a trivial insubordination led to his expulsion; and next year he was entered at Balliol College, Oxford, with a view to his taking orders. This, however, he ultimately declined to do, having been led by his sympathy with the French revolution, into a considerable departure from the orthodox civil and religious standards. In 1794, he left Oxford, having published the year before, in conjunction with his friend Robert Lovell, a small volume of poems, the first literary venture of a life thenceforward to be almost wholly devoted to literature. Shortly after, he received from Cottle, for his first poem of any length, *Joan of Arc*, the sum of £50; and in Nov., 1795, he was married to a Miss Fricker of Bristol; Coleridge, with whom he had become intimate, on the same day marrying a sister. After passing some little time with this uncle in Portugal, engaged in a diligent study of the language and literature of that country and of Spain, he became a student of law at Gray's Inn. Here he worked at his new poem of *Madoc*, and learned nothing whatever of law, a pursuit which he speedily relinquished as hopeless. In 1801 he accepted a situation as secretary to Mr. Corry, chancellor of the exchequer for Ireland; but finding its duties distasteful to him, he very soon threw it up, and finally betook himself to literature as his sole source of livelihood.

In 1804 he settled himself at Greta Hall, near Keswick in Cumberland, where he spent the remainder of his life, working with the regularity of a machine, happy in his family relations and his unremitting daily round of congenial, though continuous toil. His biography thence onward for 40 years, till the pen dropped from his fingers, might be summarized in the list of his works, which of itself would fill a page or two. In addition to these formal publications, he wrote largely for various periodicals, notably for the *Quarterly Review*, to which, from its establishment in 1809—having now become as violently conservative in his views as in youth he had been revolutionary—he was a most constant and valued contributor.

In 1807, in consideration of his services to literature, a pension of £160 per annum was awarded him; and in 1813, on the death of Mr. Pye, he succeeded him as poet laureate. Through Sir Robert Peel, in 1835, he received a further pension of £300, and along with it the offer of a baronetcy, which, however, he decided to decline. His first wife dying in 1837, he, two years after, was married to Miss Caroline Bowles. On March 21, 1843, he died, his few last years having for the most part been passed in a state of painful mental stupor, which incapacitated him for literary exertion.

Southey's poetry—except in a few of his shorter ballad pieces—can at no time be said to have been popular, and is now nearly forgotten. His chief works are *Madoc*, *Thalaba*, *The Curse of Kehama*, and *Don Roderick*, of which the last two are reckoned the best. In all of them are to be found noble passages, in which an ample and stately rhetoric counterfeits with surprising success the pure instinct of music; but they rather skillfully illustrate the art and technic of poetry than breathe its essential life. As a prose writer he ranks high; his style is easy, lucid, agreeable, nicely modulated throughout, and readily rising into eloquence on suggestions of sentiment and subject. His life and correspondence, edited by his son, was published in 6 vols. (1849); and a selection from his letters (1856); his *Correspondence with Caroline Bowles* (1881).

SOUTHGATE, HORATIO, D. D., B. M., in 1812, graduated at Bowdoin college in 1832, and Andover theological seminary in 1835; ordained in the Protestant Episcopal church in 1836; bishop of Constantinople, 1844-50; resigned, and was elected bishop of California in 1850, but declined; rector of St. Mark's church, Portland, Me., 1851-52, and of the church of the Advent in Boston, 1852-58. He published *Tour in Armenia, Kurdistan, etc.* (2 vols.); *Practical Directions for Lent*; *Visit to the Syrian Church of Mesopotamia*; *The War in the East*; *Parochial Sermons*. He died, 1894.

SOUTHINGTON, a town in Hartford co., Conn.; on Quipiac river; and on the New York, New Haven and Hartford railroad; 22 miles north of New Haven. Originally a part of Farmington, and called Panthorn, it was settled about 1697, and was incorporated in 1779. It has the Lewis high school, electric street railroads, national and savings banks, about a dozen churches, a weekly newspaper, and manufactories of general hardware, tinnery machines and tools, wood screws, pocket cutlery, carriage hardware, bicycle supplies, bolts, etc. There are several villages and a borough of the same name. Pop. '90, 5501.

SOUTH KINGSTOWN, a town in Washington co., R. I.; on Block Island sound, and the New York, New Haven, and Hartford, and the Narragansett Pier railroads; 23 miles s. of Providence. It contains several villages, including Kingston, the co. seat, Perryville, Peace Dale, and Wakefield; was incorporated in 1722-3; and has the Rhode Island college of agriculture and the mechanic arts, high school, Robert B. Hale library,

Narragansett library, Kingston free library, Hazard memorial hall, electric lights, water-works, national and state banks, town hall, militia armory, G. A. R. hall, weekly newspaper, and manufactories of cotton and woolen goods, carriages, etc. Pop. '90, including the district of Narragansett, 6231.

SOUTH NORWALK, a city in Fairfield co., Conn.; on the Norwalk river, and the New York, New Haven, and Hartford railroad; 33 m. s.w. of New Haven. It is in the town of NORWALK (q. v.); has national and savings banks, electric lights, electric street railroads, daily newspaper, public library, the Roth and Goldschmidt free library, and manufactories of felt hats, locks, shoes, paper boxes, steam engines, machinery, bronze goods, air compressors, force pumps, etc.; and is in daily steamer communication with New York. Pop. '90, 4013.

SOUTH ORANGE, a township and village in Essex co., N. J.; on the Rahway river, and the Delaware, Lackawanna, and Western railroad; 5 miles n.w. of Newark, the co. seat. It is the seat of Seton Hall college (R. C.), and has several public and private schools, new town hall, public library, electric railroad communication with Newark and the other Oranges, gas and electric lights, and several handsome churches. South Orange is located on the Orange mountains, in a region of much natural beauty, largely built up by New York business men, and has many objects of interest to the tourist. Pop. '90, 3106.

SOUTH SEA SCHEME, THE, commonly designated the SOUTH SEA BUBBLE, was originated by Harley (q.v.), earl of Oxford, in 1711, with the view of restoring public credit, and providing for the extinction of the floating national debt, which at that time amounted to £10,000,000. This debt was taken up by a number of eminent merchants, to whom the government agreed to guarantee for a certain period the annual payment of £600,000 (being 6 per cent. interest), a sum which was to be obtained by rendering permanent a number of import duties. The monopoly of the trade to the South seas was also secured to these merchants, who were accordingly incorporated as the "South Sea company," and at once rose to a high position in the mercantile world. The company's trading projects had no other result than a single voyage of one ship in 1717, but they obtained a firm hold on popular favor, and the shares rose rapidly. Trusting to the possibility of pushing credit to its utmost extent without danger, they proposed, in the spring of 1720, to take upon themselves the whole national debt (at that time £30,981,712), on being guaranteed 5 per cent. per annum for $7\frac{1}{2}$ years, at the end of which time the debt might be redeemed if the government chose, and the interest reduced to 4 per cent. The directors of the bank of England submitted a counter-proposal, but parliament, against the protests of sir Robert Walpole, lords North and Grey, and others, accepted the South Sea company's offer. The prospect of amassing wealth led the directors to throw aside all scruples and to devise every means for keeping up the fictitious value of the stock. In the beginning of Aug. the shares were quoted at 1000, when the chairman and some of the principal directors sold out. A wide-spread uneasiness seized the holders of stock. The country now demanded the punishment of the fraudulent directors. The officials of the company were forbidden to leave the kingdom for twelve months, or to dispose of any of their property or effects. Ultimately it was proved that the earl of Sunderland, and others, had been bribed to promote the company's bill in parliament. Equally flagrant iniquity in the allocation of shares was discovered, in which, among others, Mr. Aislabie, the chancellor of the exchequer, was implicated. Through the partiality of parliament, Stanhope and the earl of Sunderland were acquitted; but Mr. Aislabie and the other directors, who were members of the house of commons, were expelled. Of the £13,300,000 of real stock belonging to the company, £8,000,000 was divided among the losers, giving them a dividend of $33\frac{1}{2}$ per cent.; and by other schemes of adjustment the pressure of loss was fairly and widely distributed. See Cox's *Walpole*, Mackay's *Popular Delusions*, and the various histories of England during this period.

SOUTH SHETLAND, or NEW SOUTH SHETLAND, an Antarctic archipelago lying about 600 miles s. of Cape Horn, between 61° to 63° 20' s. lat., and 54° to 63° w. long., separated from Graham's Land and Louis Philippe Land by the Bransfield strait. The islands are twelve in number, the chief of which are George, Livingston, Smith, Deception (with circular crater), Elephant, and Clarence. The total area is about 880 sq. miles. Ice and snow lie at the sea-level all the year. They were first discovered in 1599 by Dirk Gheritz. The region was explored by Sir John Ross in 1842, and in 1893 by Laskar in the "Jason," who determined the coast-line of Graham's Land to the 69th degree s. lat.

SOUTHWARK. See LONDON.

SOUTHWELL, ROBERT, 1562-95; b. England; educated on the continent; became prefect of the Jesuits' college at Rome in 1585; was sent in 1586 as a missionary to England; apprehended in 1592 on a charge of conspiracy against the government of queen Elizabeth; imprisoned in the Tower for three years, and though put to the torture ten times, confessed only that he came to England for the purpose of making converts to the Roman Catholic faith; was tried in court of king's bench, found guilty, and hanged at Tyburn in 1595, though there seems to have been scant proof of his crime. His important poems are contained in *St. Peter's Complaint and other Poems*, with a sketch of

his life. His chief prose works are *Triumph over Death*; *Epistle of Comfort*; *Marie Magdalen's Funeral Teares*. Complete editions of his works have been published.

SOUTHWORTH, CONSTANT, 1614-85; b. Leyden, Holland; came to New England in 1621 with his mother; was one of the colonists of Duxbury; often a member of the legislature; assistant-governor of Plymouth, and governor of the Kennebec plantation.

SOUTHWORTH, EMMA DOROTHY ELIZA (NEVITTE), b. Washington, D. C., in 1819; commenced writing tales and sketches for the *National Era*, Washington. She has published *Retribution*; *The Deserted Wife*; *Shannandale*; *The Curse of Clifton*; *The Lost Heiress*; *The Discarded Daughter*; *Cruel as the Grave*; *Tried for her Life*; *A Beautiful Fiend*; and many others. Her novels show strong dramatic power, are high in color, and have been popular. She has been a frequent contributor to the *New York Ledger*. Her complete works were published in Philadelphia in 35 vols.

SOUTHWORTH, NATHANIEL, 1806-58; b. Mass.; began the study of drawing in Boston and became a miniature painter of high rank in the profession. He went to Europe in 1848, and on his return resided in New York and Philadelphia.

SOUVAL'KY, or SUVALKY, chief t. of the government of the same name, in Poland, is situated on the left bank of the river Charnagarche, a tributary of the Niemen, 538 m. s.w. of St. Petersburg. Pop. '94, 17,519.

SOUVESTRE, EMILE, 1806-54; b. France. In 1820 he engaged himself as a publisher's clerk at Nantes; afterward earned his living as a journalist and litterateur, and in 1836 settled in Paris. After the revolution of 1848 he delivered popular lectures in the new school of administrative science, and later in Switzerland, which were published as *Causeries Historiques et Littéraires* in 1854. He wrote many didactic novels and tales, and his *Philosophe sous les toits* received an academical prize in 1851. Among his numerous novels are *Les Derniers Bretons*; *L'Homme et l'Argent*; *Confessions d'un Ouvrier*; and *Pierre et Jean*.

SOUZDAL', a t. of European Russia, in the government of Vladimir, noted as being one of the oldest towns in Russia, having, according to certain accounts, been founded 606 B.C. Pop. '80, 9,000.

SOVEREIGN, the name applied in politics to the person or body of persons in whom the legislative power of a state is vested. In limited monarchies, sovereignty is in a qualified sense ascribed to the king, who, though the supreme magistrate, is not the sole legislator. A state in which the legislative authority is not trammelled by any foreign power is called a sovereign state. The states of the German empire were designated *mi-souveraines*, because their sovereignty was qualified by their subordination to the imperial authority; and the same term may be applied to the states of the American union.

SOVEREIGN, an English gold coin of the value of twenty shillings sterling, the standard weight of which is 123.374 grains troy. The name was first applied to a gold coin issued in the reign of Henry VIII., otherwise called the double royal or rial, on which the king was represented in the royal robes. The name disappeared after a few reigns, and was revived as applicable to the gold piece of George III., issued in 1817, of the value of twenty shillings, which was substituted for the guinea, which had previously been current, of the value of twenty-one shillings. The sovereign is worth \$4.85.

SOWEREAD. See CYCLAMEN.

SOWER, CHRISTOPHER, 1693-1758; b. Germany; a printer; came to this country and published, 1738, the first quarterly in a foreign language ever issued in Pennsylvania. He was the first to manufacture type and printer's ink in this country, and printed a quarto Bible in German in 1743. His son CHRISTOPHER, 1721-84, who emigrated with him, succeeded his father in the book-making business, and invented cast-iron stoves. During the revolution he was called *Das Brod-Vater*, the bread-father, on account of his liberal distribution of provisions to the destitute, but, joining the loyalists, his estates were confiscated.

SOWERBY, GEORGE BRETINGHAM, b. England, 1812. He published a number of books on conchology and kindred subjects, illustrated by himself, of which *Thesaurus Conchiliorum* is the most extensive. He d. 1884.

SOWERBY, JAMES, 1757-1822; b. England; began life as a teacher of drawing and painter of miniature portraits; became a botanist and mineralogist of distinction, and published seven works on those sciences, illustrated by himself; among them *English Botany, or, Colored Figures of all the Plants Natives of Great Britain*, and *British Mineralogy*.

SOWERBY BRIDGE, a small manufacturing t. in the West Riding of Yorkshire, 3 m. s.w. of Halifax. It contains iron-works, maling-houses, corn-mills, worsted and cotton factories, chemical works, and dye-works; but the woolen manufacture is the principal branch of industry. Pop. '91, 10,409.

SOW THISTLE, *Sonchus*, a genus of plants of the natural order *composita*, suborder *cichoracea*, having an imbricated involucre, swollen at the base, with two rows of unequal scales, which at length bend inward; a naked receptacle; the fruit transversely wrinkled and without a beak, the pappus hairy and without a stalk. The COMMON SOW

THISTLE (*S. oleraceus*) abounds in Britain and in most parts of Europe, as a weed in gardens and cultivated fields. It is an annual plant, delighting in rich soils, grows to the height of two or three ft., with somewhat branching stem, and small yellow flowers almost in umbels. The tender tops and leaves are much used in the north of Europe as greens.—The **CORN SOW THISTLE** (*S. arvensis*) is a perennial with large yellow flowers, frequent in corn fields in Britain, and throughout great part of Europe.—Nearly allied to the genus *Sonchus* is *Mulgedium*, to which belongs the **ALPINE BLUE SOW THISTLE** (*M. alpinum*), the beautiful blue flowers of which adorn some of the most inaccessible spots of the mountains of Switzerland and of Scotland.

SOY is a thick and piquant sauce, made from the seeds of the **SOY BEAN** (*Soja hispida*), a plant of the natural order *leguminosæ*, suborder *papilionaceæ*, so nearly allied to the genus *dolichos* (q.v.) as to be often included in it. It is a native of China, Japan, and the Moluccas, and is much cultivated in China and Japan. It is also common in India, although, probably, not a native of that country. The seeds resemble those of the kidney bean, and are used in the same way. The Japanese prepare from them a substance called *miso*, which they use as butter.

Soy is made by mixing the beans softened by boiling with an equal quantity of wheat or barley roughly ground. The mixture is covered up, and kept for 24 hours in a warm place to ferment. The mass is then put into a pot, and covered with salt, the salt used being in quantity about equal to each of the other ingredients. Water is poured over it; and it is stirred, at least once a day, for two months, after which the liquor is poured off and squeezed from the mass, filtered, and preserved in wooden vessels. By long keeping, it becomes brighter and clearer. A Chinese sauce, called *kitjap* (ketchup), is often sold in Britain as soy, but is very inferior to the true soy.

SOYER, ALEXIS, a famous French cook, was born in 1809; was chief cook at the Reform Club, London, from 1837 to 1850, and died in England in 1858. During the Crimean war he visited Constantinople and made valuable reforms in the system of army cooking. He published several books on his specialty, among them, *Cookery for the People* (1845); *Gastronomic Regenerator* (1847); and *The Modern Housewife* (1849).

SPA, a t. of Belgium, and a watering-place of world-wide celebrity, stands in a romantic valley amid hills which form part of the Ardennes chain, 17 m. s.e. of Liège, and 22 m. s.w. of Aix-la-Chapelle by railway. The prettily-built town consists almost entirely of inns and lodging-houses. The chief edifices are the *Redoute*—plain outside, but handsome within, and including under one roof a theater (open four times a week), a ball-room, etc.—and the *Vauxhall*, a second Redoute, but now little used. Gaming, which figured prominently among the amusements, was suppressed in 1872. The mineral springs, seven in number, are all chalybeate, and contain minute quantities of iron, so combined with alkaline salts and carbonic acid gas as to be both easily digested and agreeable to the palate. They are cold, bright, and sparkling, and are efficacious in complaints of the liver, nervous diseases, etc. The principal and strongest spring, the *Pontcon*, is situated within the town. Fifteen other springs are near the town, and most of them are situated amid picturesque plantations. Spa is also famed for the manufacture of wooden toys, which are stained brown by being steeped in the mineral waters. Pop. '94, 8135. The number of visitors during the season is about 12,000, largely from England. Spa was frequented as a watering-place as early as the 14th c., and has given its name to many mineral springs.

SPACCAFORNO, a city of Sicily, in the province of Syracuse, with '81, 8588 inhabitants. Opposite Spaccaforno, Roger, king of Sicily, gained a signal victory over the Saracens in 1092.

SPACE AND TIME. Space and Time being the most general conditions, forms, or attributes of all existing things, their discussion is linked with the highest problems of philosophy. Space is co-extensive with, and inseparable from, the sensible, external, or object world; time is a property both of the object world and of the subject mind.

Of the so-called innate ideas maintained by one school of philosophy, Space and Time are the foremost examples. (Other examples are number, infinity, being, substance, power, personal identity, etc.) Accordingly, it is held, on the one side, that these notions are underived, or intuitive to the mind; and, on the other side, that they arise in the course of our education or experience, like our ideas of heat, sound, color, gravity, etc.

To begin with space. The supporters of the innate or intuitive origin of the idea allow that it does not arise in the mind until actual objects, or extended things, are presented to the senses—until we see the visible, and touch the tangible things around us; but they declare that this contact with the sensible world is only the *occasion* of our becoming conscious of what was already in the mind. Thus, Mr. Mansel says: "Space is not properly an *innate idea*, for no idea is wholly innate; but it is the innate element of the ideas of sense which experience calls into consciousness." It is, in short, the superadding of some independent activity of the mind to the passive sensation. The reasons usually given for assuming an intuitive element in the idea of space are, in the main, the reasons given for innate ideas generally; they chiefly resolve themselves into affirming

the attributes of *universality* and *necessity* in such ideas ; and the inadequacy of mere sensible experience to reveal these high attributes of things. Whatever is got by experience can be thought away ; space and time cannot. Thus, it is impossible for us to receive any sensible impression of an outward object—the sun, for example—without conceiving that thing as existing in space. To use the language of Kant, space is a form of our sensibility, or sensible perception ; and as the perception itself cannot, he thinks, give this universal and inseparable form—it must be contributed by the mind. Sir W. Hamilton supposes that we may have an “empirical” notion of space—i.e., a notion from experience ; but that space as a “form” is not obtained from experience, but from intuition. He does not, however, explain clearly wherein consists the difference between these two notions.

According to the opposite view space is an abstraction from our experience of extended things, exactly as gravity is an abstraction from gravitating bodies, and justice from just actions. We first obtain from experience a variety of impressions, in the concrete, of things possessing extension ; and, next, from all these, by the usual process of abstraction, we gain a notion of extension in the abstract, or space. A few remarks may be made on these two distinct operations, as both involve matters of controversy.

1. Before the muscular feelings were distinctly recognized as something superadded to the proper sensations of the senses—or the feelings of mere light, sound, etc., it was not easy to show that, by sensible experience alone, we could perceive objects as extended, or as occupying space. The pure optical sensibility of the eye is for color solely ; the pure tactile sensibility is for softness and smartness, roughness and smoothness, etc. When, however, we make full allowance for the whole range of feeling connected with the exercise of muscular energy, there is no difficulty in accounting for the origin of such notions as resistance (force or power) and extended magnitude. The element supposed by the *à priori* philosophers to be contributed by the mind itself, is according to the other school, muscularity, or the feeling of the putting forth of inward energy. The two senses related to our cognizance of space—sight and touch, are compound senses ; they involve an active energy, with its peculiar consciousness, as well as a passive sensibility ; and all that is characteristic of extension or space arises through these muscular accompaniments.

2. Having perceived a great number of things as extended, with the intervals of unoccupied extension that separate these, we form an idea of extension in the abstract. The distinguishing peculiarity of this abstraction is related to *unoccupied* extension, or empty space, where we seem to have extension without anything extended ; rendering the idea of space unlike other abstract ideas, as gravity, or justice, which are conceivable only as embodied in gravitating things, or just actions. Still, empty space is a reality to us, inasmuch as it expresses cessation of resistance, and free scope for movement. To the senses alone, without the muscular accompaniments, space would be a nonentity ; an inconceivability ; but the feeling of the sweep of the arm, or of the locomotion of the body, in passing from one point of resistance to another is a genuine mental experience—the filling up of the interval between two tactile encounters, or between two optical pictures, with conscious activity.

The idea of TIME, continuance, or endurance, applies both to our feelings of energy put forth, and also to our sensations, emotions, and the flow of our ideas ; in other words, it attaches both to the extended or object world, and to the unextended or subject mind. In our muscular feelings, which represent the universe of matter and space, we discriminate a dead strain, or effort of resistance, lasting a short time from the same strain lasting a longer time ; and also a more persisting movement from a less. So in the sensations ; a sound enduring a second is different to us from a sound enduring two seconds ; a transitory odor is not confounded with one of greater continuance. We distinguish two bursts of wonder, terror, love, or anger, if they have been unequal in their duration. Abstracting from all these experiences of continuance in the concrete, we obtain the idea of time ; which idea, however, like other abstractions, must be conceived by us under some individual continuing thing. If we were to imagine the whole outward universe annihilated, we should still have, in our own consciousness, an instance of the continuing, and upon that we could sustain the conception of time. See GENERALIZATION.

Time is measured by space, and space by time. The one is often expressed by the other, but with a certain limitation ; we say “a space of time,” but not “a time of space.” Movement is common to both. Of passive sensations, the best for indicating time are those of hearing.

SPACE, a term in music used to describe any note situated on an enclosure between the lines of the stave. The stave is made up of five lines and four spaces.

SPADE-HUSBANDRY, COTTAGE-FARMING, and FIELD-GARDENING, are phrases of synonymous meaning, and denote the cultivation of farm-crops on a small scale by means of the spade. This system has long been in operation in Belgium and Flanders, where the holdings average little more than five, though a few are as large as forty acres ; and by steady industry and economy, even the smallest of them is capable of maintaining a family in comfort. In Great Britain, cottage-farming is chiefly practiced among the miners in Cornwall, who at first received leases of their coarse unreclaimed land at 2s.6d.

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—5s. per acre, the lease to last for three lives. These patches of from three to five acres number over 6,000, and have increased greatly in value. In Orkney and Shetland, some of Sutherlandshire, and much of the Western isles of Inverness and Argyleshire, spade-culture is quite common, and when properly done is a thorough means of cultivation. In Lincolnshire, especially on the isle of Axholme, the same system exists. The success of small-farming depends on two causes—the inexpensiveness of the stocking and implements, and the superior fertility of the soil when dug. The implements required are—spades and digging-forks of different sizes, hoes, rakes, scythe, reaping-hooks, flail, hay-fork, wheel-barrow, and a few other implements equally inexpensive; the steading consists of the cottage, a cow-shed (for one or two cows), and a pig-sty; the stock, of cows, pigs, and poultry, besides household furniture. The superiority of the spade over the plow rests on its deeper cultivation; on its not forming a hard impermeable crust on the surface of the subsoil, as the plow does; on its more thorough subdivision of the soil; and on its more effective burying of weeds. Besides the treading of the land by the horses' feet is avoided.

SPADA, LEONELLO, b. Bologna, 1576; d. Parma, 1622; an Italian painter, a student of the Carracci and of Caravaggio. His principal works were executed at Reggio, Modena, and Parma, and the principal one is "San Domenico burning the proscribed Books of the Heretics."

SPADIX. See **SPATHE**.

SPAGHETTI. (Italian). The name of the smaller and more delicate kind of macaroni (q.v.), one size larger than vermicelli (q.v.).

SPAGNOLET TO. See **RIBERA**.

SPAHIS (the same with *Sipahi*, or Sepoy q.v.) were the cavaliers furnished by the holders of military fiefs to the Turkish army, and formed the *élite* of its cavalry. The spahis, along with the Janizaries (q.v.) owe their organization primarily to Orchan, the second of the Ottoman sultans, finally to sultan Amurath I.; and when levied *en masse*, could number 140,000, but such a levy was very seldom called for. In the field, they were divided into two classes, distinguished by the color (red and yellow) of their standards; one class had pistols and carbine, the other a bow and arrows, and both carried a saber, lance, and *jerid*, or javelin. They were excellent irregular troops; but when European organization was introduced into the Turkish army, they were replaced (1826) by regular horse. At the present time, the French have numerous regiments of spahis, raised from among the native tribes of Algeria and from France in about equal proportions; the dress, especially of the indigenous soldiers, partakes very much of the Arab character. The natives are allowed to rise to any grade below that of capt.; but all the superior officers are of French descent. See **ZOUAVES**.

SPAIGHT, RICHARD DOBBS, about 1758–1802; b. New Berne, N. C.; educated at Glasgow university; returned to North Carolina shortly before the revolution, and fought on the American side. He was a member of congress, 1782–83, and 1798–1801, and of the constitutional convention of 1787. From 1782 to 1785 he was the governor of North Carolina. Spaight was killed in a duel with one John Stanly.

SPAIGHT, RICHARD DOBBS, JR., was born at New Berne, N. C., in 1796; was educated at the University of North Carolina, where he graduated in 1815; became a lawyer, and in 1819 was elected to the state assembly. He was a member of the state senate, 1820–22, and of congress, 1823–25. He was again a state senator in 1825–34; in 1835 was elected a member of the state constitutional convention, and also governor of the state, serving two years. He died at New Berne in 1850.

SPAIN (Span. *España*), a kingdom of Europe, occupying the larger portion of the great peninsula which forms the s.w. corner of the European continent, reaching further s. than any other European country, and further w. than any except Portugal. It is bounded on the n. by the bay of Biscay and by France, from which it is separated by the mountain ridge of the Pyrenees; on the e. and s. by the Mediterranean and Atlantic; and on the w. by the Atlantic and Portugal. Greatest length, from Fuenterrabia on the n. to Tarifa on the s. 560 m.; greatest breadth, from cape Finisterre (Land's End), the extreme point on the w., to cape Creuze, the extreme point on the e., about 650 miles; average breadth about 380 miles. Area, including the Balearic (q.v.) and Canary isles, 195,738 sq.m.; pop. '87, 17,550,246. The country, including the Balearic and Canary isles, was divided in 1834 into 49 modern provinces, though the former division, into 14 kingdoms, states, or provinces, is still sometimes used. The following is a table of the ancient states, and of the modern provinces into which they have been divided, with their areas and populations, according to the most recently published estimates—those of 1887—and in the same year, Great Britain and Germany acknowledged her right to the protectorate of the Caroline Islands (q.v.), which have an area of 560 sq. miles and a population of 36,000 souls. This gives to Spain in Asia colonial possessions with an area of 116,256 sq.m. and a population of 9,619,665. In 1885 the sovereignty of Spain was extended over the Sulu islands (q.v.); area, 950 sq.m.; pop. 75,000.

Ancient Provinces.	Modern Provinces.	Area in English Square Miles.	Population in 1887.
NEW CASTILE.	Madrid.....	2,997.2	684,630
	Toledo.....	5,586.3	359,562
	Guadalajara.....	4,869.3	201,496
LA MANCHA.	Cuenca.....	6,735.9	242,024
	Ciudad-Real.....	7,840.3	292,291
OLD CASTILE.	Burgos.....	5,651.0	337,822
	Logrono.....	1,945.1	181,465
	Santander.....	2,112.7	242,843
	Soria.....	3,836.3	151,471
	Segovia.....	2,713.5	154,457
LEON.	Avila.....	2,981.7	193,033
	Palencia.....	3,126.5	188,954
	Valladolid.....	3,042.7	267,297
	Leon.....	6,166.9	380,229
	Zamora.....	4,135.6	269,621
ASTURIAS.	Salamanca.....	4,940.0	314,424
	Oviedo.....	4,091.3	595,420
GALICIA.	Coruna.....	3,078.6	613,792
	Lugo.....	3,787.3	431,644
	Orense.....	2,738.7	405,074
ESTREMADURA.	Pontevedra.....	1,739.2	443,385
	Badajos.....	8,687.8	480,413
	Caceres.....	8,013.9	339,793
	Seville.....	5,295.5	543,944
	Cadiz.....	2,809.3	429,381
ANDALUSIA.	Huelva.....	4,122.4	254,831
	Cordova.....	5,190.1	420,714
	Jaen.....	5,184.2	437,842
	Granada.....	4,937.6	484,341
	Almeria.....	3,302.5	339,383
MURCIA.	Malaga.....	2,823.7	519,377
	Murcia.....	4,477.9	491,438
	Albacete.....	5,971.8	229,492
VALENCIA.	Valencia.....	4,352.2	733,978
	Alicante.....	2,098.3	432,335
	Castellon de la Plana.....	2,446.6	292,437
ARAGON.	Saragossa.....	6,607.4	414,007
	Huesca.....	5,878.5	254,958
	Teruel.....	5,494.2	241,865
CATALONIA.	Barcelona.....	2,985.3	899,264
	Tarragona.....	2,451.4	348,579
	Lerida.....	4,774.8	285,417
BASQUE PROVINCES.	Gerona.....	2,271.9	305,539
	Navarre.....	6,046.0	304,051
	Biscay.....	848.6	235,659
	Guipuzcoa.....	737.7	181,856
	Ala7a.....	1,205.3	92,893
	Total.....	193,111.0	16,949,872
ISLANDS.	Balearic.....	1,860.0	312,646
	Canaries.....	2,808	287,728
	General Total.....	197,779.0	17,550,246

Colonies.—The colonies of Spain cover an area of 405,338 sq. miles, with a population, in '87, of 9,695,567. In point of population, the Spanish possessions in Asia are the largest. They include the Philippine islands, Sulu islands, Caroline islands and Palaos, and Marianne islands, with a population of over 7,000,000. In Africa the Spanish possessions are Rio de Oro and Adrar, Ifni, Fernando Po, Annabon, Corisco, Elobey, and San Juan. The Canary islands are reckoned administratively as a part of Spain. In America, Spain has Cuba and Porto Rico.

Coast-line.—The entire perimeter of the country is 2,080 English m., and the coast-line, exclusive of windings, is 1317 m. long, of which 712 m. are formed by the Mediterranean, and 605 m. by the Atlantic. The n. coast, from Fuenterabia w. to cape Ortegal, is unbroken by any considerable indentation. A wall of rocks, varying in height from 30 to 300 ft., runs along this shore; but the water, which contains considerable depth close to the beach, is not interrupted to any unusual extent by islands or rock. The n.w. coast, from cape Ortegal s. to the mouth of the river Minho—which separates the Spanish province of Galicia from Portugal—though rock-bound, is less elevated, and is much more broken than the shores washed by the bay of Biscay; and the indentations, the chief of which are Noya Arosa and Vigo bays, form secure and spacious harbors. From the mouth of the Guadiana, on the s., to the strait of Gibraltar, the coast-line, though well-defined, is low, sandy, and occasionally swampy. From Gibraltar to cape Palos the shores, which are backed in part by the mountain-range of the Sierra Nevada, are rocky and high (though flats occur at intervals), are unbroken by indentations, and comprise only two harbors, those of Cartagena and Malaga. A low, and for the most part sandy, coast extends n. from cape Palos, rising into rocky cliffs and bluffs in the vicinity of Denia, but extending in sandy flats from Denia to the mouth of the Ebro. From the mouth of this river, n. to the frontier of France, the coast is alternately high and low, and its principal harbors are Barcelona and Rosas.

Surface and Hydrography.—The compactness and the isolation of this country, and its position between two seas, the most famous, and commercially the most important in the world, are not more in its favor than the character of its surface, which is more diversified than that of any other country in Europe of equal extent. An immense plateau, the loftiest in the continent, occupies the central regions of Spain, and is bounded on the n. and w. by mountainous tracts, and on the n.e. by the valley of the Ebro; on the e. by tracts of land frequently low, but in some parts traversed by hill-ranges; on the s. by the valley of the Guadalquivir, which intervenes between it and the Sierra Nevada (q.v.). This great plateau rises to the height of from 2,000 to 3,000 ft., and occupies upward of 90,000 sq. m., or about half of the entire area of the country. The whole of the Pyrenean peninsula is divided by Spanish geographers into 7 mountain ranges, of which the chief are: 1. The Cantabrian mountains (q.v.) and the Pyrenees (q.v.), forming the most northern range; 2. The Sierra de Guadarrama, separating Leon and Old Castile from Estremadura and New Castile, and rising in the peak of Penalara 7,764 ft. above sea-level; 3. The Montes de Toledo, forming a part of the watershed between the Tagus and the Guadiana; 4. The Sierra Morena (q.v.), between the upper waters of the Guadiana and Guadalquivir; 5. The Sierra Nevada (q.v.), running parallel with the shores of the Mediterranean, through southern Murcia and Andalusia, and rising in its chief summits to loftier elevations than are found in any mountain-system of Europe, except that of the Alps. The several mountain-ridges, or as they are called, *Cordilleras* of Spain, have a general e. and w. direction, and between them run, in the same direction, the nearly parallel valleys or basins of the great rivers of the country, the Douro, Tagus, Guadiana, and Gaudalquivir, each of which is described in its proper place.

Climate and Soil.—The climate of Spain, owing to the extent and configuration of the country, is exceedingly various. In the n.w. (maritime) provinces, it is damp and rainy during the greater part of the year; at Madrid, which is situated about 11° s. of London, and only 5° n. of the shores of Africa, winters have occurred of such severity, that sentinels, while on duty, have been frozen to death; while the s. and e. provinces are warm in winter, and are exposed to burning winds from the s., and to an almost tropical heat in summer. Both ancient and modern geographers have adopted difference of climate as the rule for dividing the peninsula into tracts distinct as well in soil and vegetation as in temperature. Of these tracts or zones the first and most northern may be considered as embracing Galicia, Asturias, the Basque provinces, Navarre, Catalonia, and the northern districts of Old Castile and Aragon. In this tract the winters are long, and the springs and autumns rainy, while n. and n.e. winds blow cold from the snow-covered Pyrenees. The country, which alternates with hill and dale, is plentifully watered by streams rich in fish, and meadows yielding rich pasturage abound. Corn scarcely ripens in the more exposed districts, but grain crops of all kinds are produced in others, as well as cider, wine, and valuable timber. The middle zone is formed mainly by the great central plateau, and embraces northern Valencia, New Castile, Leon, and Estremadura, with the s. parts of Old Castile and Aragon. The climate of the great part of this region is pleasant only in spring and autumn. Throughout the chilly winter, the treeless table-lands are over-swept by violent tempests, and in summer are burned up by the sun. The soil is generally fertile, and corn and wine are most abundantly produced. The southern or Bætic zone, comprising the rich country that extends between the southern wall of the central plateau and the Mediterranean shores, includes Andalusia, Murcia, and southern Valencia. The stony rampart on the n. protects it from the chilly winds of the central zone; but it is unprotected against the hot winds (the *Solana*, see *SIMOON*) which in summer blow n. from Africa, and render this season intolerable to northern Europeans. Here the winter is temperate, and the spring and autumn delightful beyond description. The descent from the cold and mountainous central regions to this tract of tropical heat and fertility affords a most striking contrast. The soil, which is artificially irrigated, is well adapted to agriculture and the cultivation of heat-loving fruits. The products comprise sugar, cotton, and rice, and the orange, lemon, and date.

Material Revival of Spain; Population; and Distribution of Land.—Owing to a number of causes, Spain, at one time the most opulent kingdom in Europe, had in the 18th c. lapsed into a state of complete stagnation; the spirit of enterprise seemed extinct, and ease and squalor to be preferred to labor and affluence. Before the commencement of the present century, however, the country began to throw off its lethargy, and since that time the rate at which it has been advancing toward a healthy condition of active life has become gradually accelerated. Since 1851 the onward movement of the nation has been as rapid as that of any of the great European powers. The population has greatly increased, and is increasing; agriculture, previously stagnant, is now carried on with activity and success; manufactures are multiplying rapidly; and railways, of which in the beginning of 1848, not a mile had been constructed, are now in process of being laid out between all the great centers of population—7543 m. having been completed in 1894. A view of the increase of the population, the first basis of power, will afford an index of the growing prosperity of the country. The estimates of the population of Spain for various periods between the beginning of the 16th c. and the middle of the 18th c. vary considerably; but it is certain that there was a gradual decrease of from

2,000,000 to 3,000,000 of inhabitants between the years 1500 and 1700. With regard to later times, we have the following authentic statement:

Year.	Population.
1763.....	9,159,999
1797.....	10,541,221
1857.....	15,464,340
1860.....	15,673,536
1870.....	16,835,506
1887.....	17,550,246

It thus appears that in about a century the population of Spain has increased over 8,000,000. Comparing the census of Dec., 1877, with that of Dec., 1887, we find that the provinces in which the population has most largely increased are Madrid, Barcelona, Tarragona, Murcia, Cadiz, Valencia, Biscay, Avila, Salamanca, Jaen, and Valladolid. These are for the most part maritime provinces, or such as, from their vicinity to the coast, have facilities for communication with the sea; and, this being the case, it may be fairly argued that the rapid extension of the railway system now going on, will—besides acting favorably on the whole kingdom—have a specially beneficial effect upon the interior provinces. In agriculture as well as in population, the onward movement has been remarkable. The vast mountains of the country affording for the most part only scanty crops of herbage, are utilized as pasture-grounds, and are divided into large farms. But in the warm and fertile plains, especially in localities where water is abundant, the farms are small. About 80 per cent. of the soil is productive. Wheat, barley, maize, rye, and potatoes are extensively raised.

Origin of the People.—The Spaniards are a mixed race, and have sprung from a greater variety of stocks than any other European nation. The bulk of the people is doubtless descended in the main from the ancient Celtiberian occupants of the peninsula. At an early time, however, there were extensive Phenician and Carthaginian settlements in Spain, especially on the eastern sea-board. Later, the country was penetrated with Roman elements, and was Romanized throughout, save in the Basque (q.v.) country, where the ancient speech still lives on intact. Gothic invasions left a large Germanic strain in the blood of Spain, which may yet be plainly traced in the hill-country of the n.e. The Arab conquerors of Spain planted themselves too firmly on Spanish soil to be utterly expelled; and the Moriscoes (see Moors) are still, to the number of 60,000, easily distinguishable by their tongue and other peculiarities. In the s. and center Gypsies (*Gitanos*) are numerous, and there are some Jews. One result of this commingling of races may be seen in the strongly marked provincial peculiarities of Spain, extending not merely to dialectal differences, but to physique, character, and amusements. The Castilian is the literary language of Spain; the Andalusian diverges somewhat broadly from it; in Catalonia, Valencia, and on the Balearic isles, the prevailing dialect is closely allied to Provençal; while in the Basque provinces the old tongue is still in universal use among the people. Until lately (see *FUEROS*), the Basques enjoyed quite peculiar privileges as to local government and administration. In spite of great local differences of character, the Spaniard is generally temperate, and his few wants are easily satisfied. He requires a daily siesta, is not very energetic by nature, loves music, dancing, and the bull-fight, and is not averse to intrigue and the use of weapons. Even amid poverty and squalor, native dignity never forsakes him. The houses are generally poorly furnished and uncomfortable, and often far from cleanly. See *SPANISH LANGUAGE*.

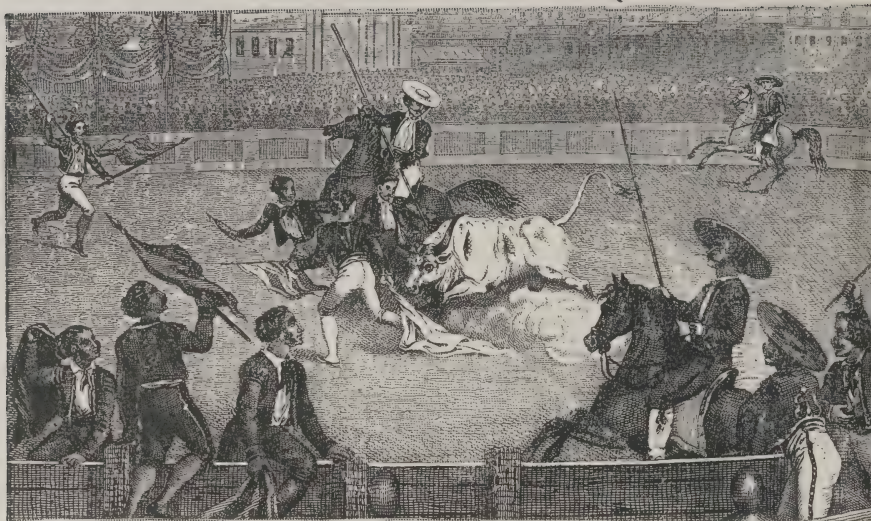
Religion.—Until 1876 the Roman Catholic faith, to which almost all the nation adheres, was the only creed tolerated by law, but the constitution of that year contains a clause allowing liberty of private worship to Protestants, although the constitution declared at the same time that the worship and ministers of the Roman Catholic faith are to be maintained by the nation. Before the suppression of the monasteries in 1836, about one-fifth of the whole nation was engaged in the service of the church.

Education.—The population of Spain contains a large number of illiterates, although the proportion has apparently decreased since 1860. In 1889 about 28.5% of the total population could read and write. There was an extensive scheme for promoting education outlined in 1857. By a law passed in that year, education was to be compulsory, and there was to be a primary school for every 500 inhabitants, but the plan has not been effectively carried out. Compulsory attendance has not been enforced, and the poor pay received by the teachers has rendered instruction inefficient. There are ten universities, attended by about 16,000 students.

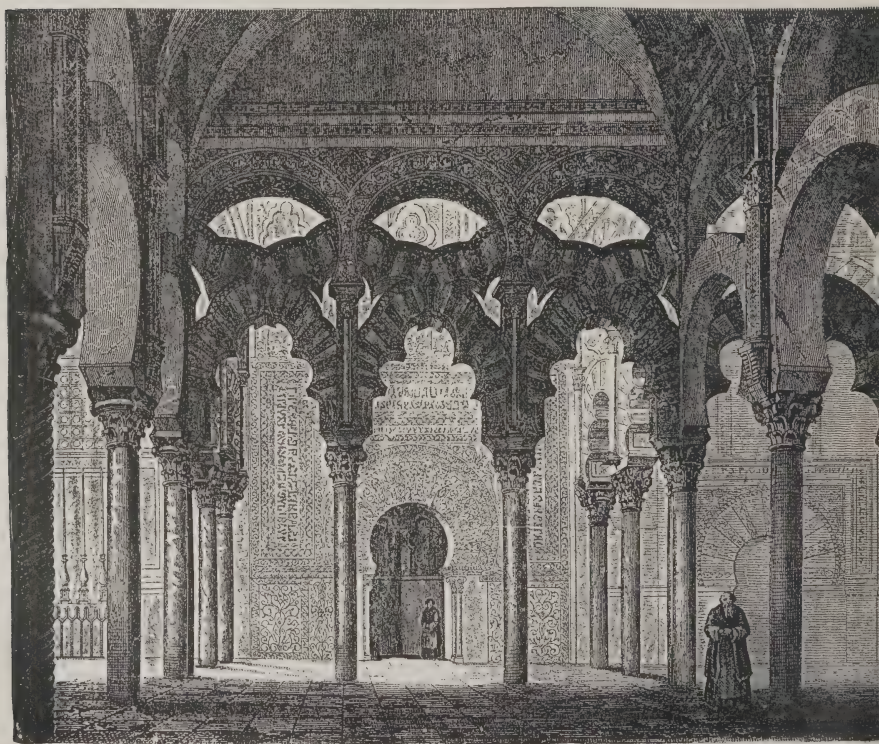
Production and Commerce.—Nearly four-fifths of the soil of Spain is classed as productive, and of this about one-third is devoted to the raising of agricultural products and vegetables. The principal crops are wheat, rye, maize, barley, esparto, flax, hemp, and pulse. The wine production is also very important, and fruits, especially oranges, raisins, grapes, nuts, and olives, are exported in large quantities. The agricultural holdings as a rule are small, the number of them having greatly increased during the 19th century. Though the silk industry declined, the silkworm culture is carried on quite extensively in some parts of the country for the purpose of obtaining from the grub, material for a fine strong thread, which, being transparent, is extensively used as snells for fish hooks.

Spain has large mineral resources, including iron, coal, zinc, lead, quicksilver, silver, salt, phosphorus, cobalt and copper. Iron abounds in the provinces of Santander, Vizcaya, Oviedo, Huelva, and Seville, and almost all of it is exported. Silver is found in considerable quantities in the province of Guadalajara and is one of the most im-

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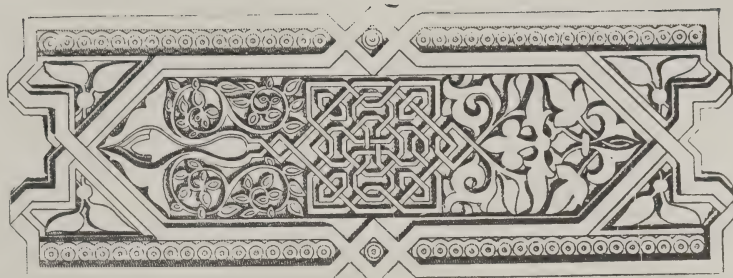
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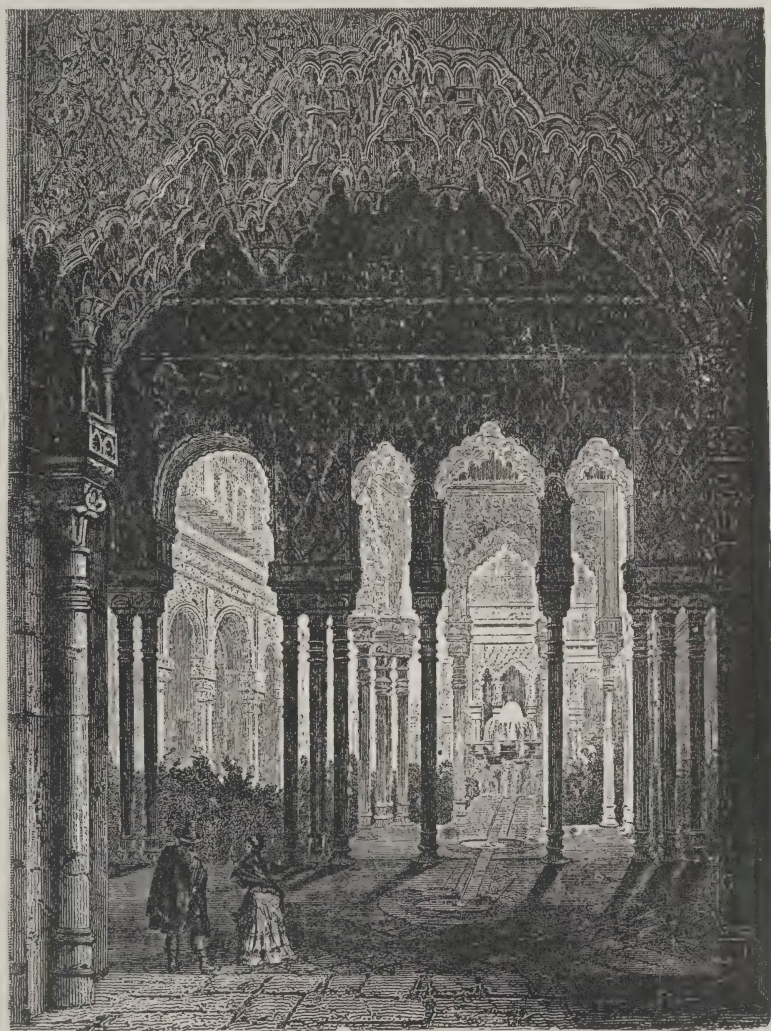
SPAIN.—1. Bull-fight. 2, 3. Stucco ornamentation, Alhambra. 4.



2



3



terior of Mosque at Cordova. 5. Court of Lions in the Alhambra.

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portant minerals in respect to the annual value of the output. Gold, along with silver, was one of the metals for which Spain was famous in very remote times, the Phœnicians, and later the Carthaginians, having worked both gold and silver mines in Spain. Pliny the younger refers to the large quantities of gold taken from Galicia, Asturias and Portugal, and, after the fall of the Roman empire, the gold mining industry was carried on with success by the Moors, but the discovery of the precious metals in the New World caused the decline of gold mining in Spain, the Spanish kings forbidding the working of mines in the peninsula in order to promote the industry in America. In recent years, however, the gold resources of a part of Spain have been developed through the efforts of some English prospectors. In the northwestern part of Galicia several gold mines have been developed with increasing success. Iron is one of the most important minerals, being very abundant, but comparatively little interest has been shown in the development of the mines, and, the iron industry being still in its infancy, little of the raw material is required for home consumption. Another important possible source of wealth in Spain which has been neglected is the cultivation of the forests. A great variety of trees are indigenous, and the soil is capable of supporting still others. The leading countries from which Spain imports her goods are England, France, the United States, Germany, Belgium, Italy, Austria, and the Spanish colonies. A very large share of her imports consists of manufactured articles, but, among raw materials, coal, raw cotton and timber are especially heavy items, and food products including fish, wheat, sugar, coffee, cocoa, etc., are also important articles of import. The exports of Spain go chiefly to the Spanish colonies, France, England, Argentine Republic, Uruguay, Mexico, Columbia, Venezuela, and Morocco. The United States, which is one of the leading countries from which Spain imports, falls far below many of the others as a receiver of Spanish goods. The customs policy of Spain is protective. A protective tariff went into effect on Feb. 1, 1892, consisting of a set of lower duties for countries having special treaty stipulations, and a set of higher duties for those without. The principal nations of Europe are entitled to the advantage of lower rates, but the United States, not having trade reciprocity, is required to pay high duties. This fact, combined with the different policy of American traders from that pursued by the European dealers, has retarded the development of commerce between the United States and Spain. As in the case of American trade with other foreign countries, too much dependence has been placed by the American exporter on correspondence and trade catalogues, and too little on direct personal communication with the Spanish market by means of agents, the latter policy being generally pursued by the more successful commercial rivals of the United States. Special causes which operated to the detriment of Spanish trade in 1895 and 1896 were the Cuban war and the revolt in the Philippine islands.

Steamship lines connect Spain with all parts of the world, but her internal facilities for transportation have not proved sufficient to develop her resources, in spite of the fact that they have greatly increased since the first railway was opened in 1848. On Jan. 1st, 1895, there were 7543 miles of railway open for traffic, and considerable additions to the railway mileage were made in subsequent years.

Spain has nominally a double monetary standard, established by the decree of Oct. 19th, 1868, which provides for the coinage of both silver and gold to be received by the government without limitation, although it is stated in the decree that the silver coins may be refused by private individuals in payment of any amount exceeding 50 pesetas. In 1876 it was enacted that all silver of national production, presented to the director of the treasury for coinage, be accepted at a certain price, but later it was provided that the price paid by the treasury should be governed by the current market price of silver. Moreover, no foreign silver should be taken, unless, in the opinion of the treasury officials, it was needed for circulation. In 1896 the status was free coinage of gold and restricted coinage of silver, the purchase of the latter metal being entirely at the will of the government. From the year 1883 gold disappeared from active circulation, having risen to a premium, and in 1896 the coinage was practically all silver and paper currency, the latter consisting exclusively of notes of the bank of Spain.

The Spanish army consists of three parts, (1) a permanent army; (2) a first or active reserve; and (3) a second or sedentary reserve. There is liability to military service on all Spaniards who have passed the age of 19, but exemption may be purchased for the sum of 1500 pesetas. In 1896 the permanent army consisted of 9,315 officers and 70,829 men, while, on a war footing, it was estimated that the regular army amounted to 183,972. See *ARMIES, MODERN*. The Spanish navy in Dec. 1896 had one battle-ship of the first-class, one port-defence ship, 112 cruisers, and 38 torpedo craft, together with a number of vessels in process of construction. See *NAVIES, MODERN*.

History.—Spain, the *Spania*, *Hispania*, and *Iberia* of the Greeks, and known to the Romans by the same names, was inhabited at the period at which it first receives historical mention, by a people deriving their origin from different races. It is supposed to have been originally inhabited by a distinct race called Iberians; upon whom, however, a host of Celts are supposed to have descended from the Pyrenees. In the earliest times of which we have any record, these two races had already coalesced and formed the mixed nation of the Celtiberians, who were massed chiefly in the centre of the peninsula, in the western districts of Lusitania, and on the n. coasts. In the Pyrenees and along the e. coast, were to be found pure Iberian tribes, while unmixed Celtic tribes occupied the n.w. In Bætica (Andalusia) there was a large admixture of the Phœnician element, and on the s. and e. coasts, numerous Phœnician, Carthaginian, Rhodian, and other colonies. A portion of the s. coast, called Tartessus by the Greeks,

the Tarshish of Scripture, was much frequented for its mineral riches by the Phœnician merchantmen, and the "ships of Tarshish" were as distinct a section of the Tyrian mercantile marine, as were the Spanish galleons of the 16th c., or our own Indiamen of more recent times. But the bond which connected the Iberians and the Phœnicians was purely of a commercial character. About the middle of the 3d c. B.C., the Carthaginian influence began to be much felt in Iberia, and a considerable tract of territory was brought under subjection to Carthage by Hamilcar (q.v.), who founded the city of Barcelona. During the next eight years, the Carthaginian interest was advanced, and its power further strengthened by Hasdrubal (q.v.—died 220 B.C.), son-in-law of Hamilcar who founded Carthago Nova (the modern Cartagena) and concluded a treaty with the Romans whereby it was stipulated that he should not advance his standards n. of the Iberus (Ebro). Hannibal (q.v.), son of Hamilcar, and the greatest of all the Carthaginian generals, now assumed the command in the peninsula. He attacked and destroyed Saguntum (q.v.), and thus violated the treaty made between his father and the Romans. The destruction of Saguntum was the cause of the Second Punic War, for the principal incidents of which see CARTHAGE, ROME, HANNIBAL, and the SCIPIOS. After the Romans had driven the Carthaginians from the peninsula in 206 B.C., the country was erected into a Roman province, consisting of two political divisions—*Hispania Citerior* (Hither Spain) including the eastern and northern districts or those nearest to the center of the Roman Empire; and *Hispania Ulterior* (Further Spain) including the districts furthest from Rome, or the southern and western districts. It was not, however, till 25 B.C. that the Cantabri and Astures in the extreme north of the country, laid down their arms to Augustus. After the country had been reduced to subjection, it was divided into the three provinces of Tarraconensis (embracing the northern and eastern provinces), Bætica (Andalusia), and Lusitania (Portugal and certain of the western provinces). This division of the country lasted till the reign of Constantine the great (q.v.), (306–37). From the time of the complete supremacy of the Romans till the death of Constantine, the condition of Spain was eminently prosperous. The inhabitants, when brought under the iron rule of the empire, were forced for the time to desist from the intestine wars in which it had been their habit to indulge, and adopting the language, laws, and manners of their conquerors, they devoted themselves to industrial pursuits, and increased remarkably both in wealth and in numbers. Everywhere throughout the country, towns of a purely Roman character sprang up, among the chief of which were Leon, Emerita Augusta (Merida), Pax Julia (Beja), Cesar Augusta (Zaragoza); and numerous aqueducts, bridges, amphitheatres, etc., were built, the ruins of which are the wonder of the modern traveler. Spain, though obtained at enormous cost both in treasure and human life, was for three centuries the richest province of the Roman Empire. Its fertile fields formed for a considerable time the granary of Rome, and from its metal-veined sierras, an immense amount of treasure in gold, silver, etc., flowed into the Roman coffers. "Twenty thousand pound-weight of gold," says Gibbon, "was annually received from the provinces of Austria (Asturias), Galicia, and Lusitania." This amount of wealth was not the voluntary offering of the natives, who were compelled to labor in their mines for the benefit of strangers; and thus Spain, in the early ages, was the type of Spanish America in the 15th and succeeding centuries, with the single difference that in the first case the Spaniards were the slaves, and in the second they were the slave-holders. In 409 A.D., hordes of barbarians, Alans, Vandals, and Suevi, crossed the Pyrenees and swept over and desolated the peninsula—the Vandals for the most part settling in Bætica, the Alans in Lusitania, and the Suevi in Leon and Castile. About 412, the Visigoths invaded the country, and their king, Athaulf, who acknowledged a nominal dependence on the Roman emperor, established the Gothic monarchy in Catalonia. See GOTHS. Of the Visigoths—by whom the Suevi were subjugated (584), the Vandals and Alans expelled (427) from the country, and large portions of Gaul annexed to their Spanish dominion—the most remarkable kings were Wallia (415–18), who greatly extended the Gothic monarchy; Euric (466–83), who, besides increasing his territory, introduced and enforced a body of laws, and did much for the advancement of civilization in Spain; Wamba (673–80), who built a fleet for the protection of the coasts; and Roderic (q.v.), who was killed at Xeres de la Frontera in 711, in battle with the Moors. The battle of Xeres gave the Moors almost undisputed mastery of nearly the whole of Spain, as well as of the outlying Gothic province of Septimania (Languedoc) in France; for the remnant of the Goths betook themselves to the highlands of Asturias, Burgos, and Biscay, where, in a region which throughout had enjoyed more liberty than any other part of Spain, they maintained their independence.

Dynasty of the Moors.—The Arabs, or, as they are more properly termed, the Moors (q.v.), held Spain for the first few years of their rule, as a dependency of the province of n. Africa; but, after the downfall of Muza (q.v.), and his son Abd-el-aziz, who had been the deputy-governor of Spain, the country was governed (717) by *emirs* appointed by the caliph of Damascus. The favorite scheme pursued by the Spanish emirs was the extension of their conquests into Gaul, to the neglect of the rising power of the Goths in Asturias; they also took the Balearic islands, Sardinia, Corsica, and part of Apulia and Calabria; the Mediterranean was infested by their fleets, but their northward progress was most signally checked on the plain of Tours by Charles Martel (q.v.). Anarchy and bloodshed were prominent features of the first 40 years of Mohammedan rule in Spain. The *walis*, or local governors of districts and provinces, frequently rebelled against the

emir, and drew sword against each other according as ambition or animosity dictated. Within this period of 40 years, no fewer than 20 emirs had been called to the direction of affairs; but a revolution at Damascus, which unseated the Ommiades, and placed the Abbasides in possession of the caliphate, put an end to this state of misrule in Spain. The last of the *emirs*, Jussuf, was in favor of the Abbasides, but the *walis* and *alcaydes* being chiefly of the Ommiade faction, invited one of this family, who was in concealment among the Zeneta Arabs in Barbary, to become an independent caliph in Spain. See OMMIADES. Thus was founded the *caliphate of Cordova*, from which, in 778, the Franks wrested all its possessions n. of the Pyrenees, and north-eastern Spain to the Ebro; the latter acquisition, subsequently denominated the *Spanish March*, being alternately in the hands of the Moors and dependent upon France.

Christian Kingdoms.—During this period of Moorish domination, the small independent kingdom of Asturias, founded by Pelayo (q.v.), had been growing in power and extent. It was increased by Galicia in 758, and by parts of Leon and Castile toward the close of the century. In 758 a second independent Christian kingdom was founded in Sobrarve, and increased by portions of Navarre on one hand and Aragon on the other, but though it, along with the French Gascons, aided the Moors at Roncesvalles (q.v.), it was, in 801, again swallowed up by the caliphate of Cordova. However, 36 years afterward a Navarrese count, casting off his allegiance to France, founded the third Christian kingdom, that of Navarre (q.v.), which from this time easily maintained itself, owing to its situation, in independence of the Moors. The kingdom of Asturias, now (900) Leon, was for a long time distracted by bitter and bloody strife among the members of the royal line, and with its neighbor Navarre would have fallen an easy prey to the powerful Ommiades, had not the latter directed their chief attention to the subjugation of Morocco; and under cover of this relaxation of the constant warfare between Moors and Christians, another independent monarchy, an offshoot from Leon, was founded in Castile (933, kingdom in 1035), which, from its central position, and consequent greater facilities for expansion, soon became the most powerful of the Spanish states, especially after its union (temporary, 1072–1157), in 1230, with Leon. A considerable part of Aragon had been wrested from the Moors by Sancho III. (1000–35) of Navarre, and at his death this part of his dominions passed by inheritance to his son Ramiro, who added to it the districts of Sobrarve and Ribagorza, and a considerable extent of country which he conquered from the common enemy, the Moors. This kingdom of Aragon was the last Christian kingdom formed in Spain; and though it increased by acquisitions from the Moors, yet being limited by Leon, Castile, and Navarre on one side, and the Spanish March (now only the county of Catalonia or Barcelona) on the other, its princes aimed at maritime power; and by the union, through the marriage of the count of Barcelona with queen Petronilla, of the Spanish March with Aragon, means were obtained of carrying out this policy, and the spread of the Aragonese dominion to Sicily (q.v.), Naples (q.v.), and other regions bordering on the Mediterranean, was the consequence. These three kingdoms—Castile and Leon, Navarre, and Aragon—continued, sometimes in combination and sometimes separately, to war against their common enemy, the Moors—Castile being, from its greater power and proximity, the most persistent assailant, and Navarre, for the opposite reason, the least so; but whenever the arrival of fresh levies from Africa, or the accession of an energetic caliph threatened serious danger to any one of the three, the others generally came to its aid.

The extinction of the Ommiades in Spain in 1031, and the disruption of the caliphate into the minor kingdoms of Cordova, Seville, Toledo, Lisbon, Zaragoza, Tortosa, Valencia, Murcia, Badajos, and seven others of less note, was an occurrence by which the kings of Castile and Aragon did not fail to benefit, for by well-directed and unremitting attacks they subdued some, rendered others tributary, the kings of Portugal also on their side gallantly and successfully pursuing the same policy; and a few years more would have certainly annihilated Moorish domination in Spain, had not Mohammed of Cordova and Seville, hard pressed by Alfonso VI. of Leon and Castile, about the close of the 11th c., applied for aid to an Arab tribe, whose military career in n. Africa had been of the most brilliant character. This tribe, the Almoravides—i.e., men devoted to the service of God—had made themselves masters of the provinces of Africa and Almagreb, and founded the empire of Morocco. Responding to the request of Mohammed, the Almoravides crossed over to Spain, defeated the king of Aragon and Castile, and recovered much of New Castile. Then, turning upon their ally Mohammed, they compelled him to yield up the provinces of Cordova and Seville, and all the minor Moorish princes to follow his example; so that, in 1094, the Almoravide sovereign was acknowledged sole monarch of Mohammedan Spain. The power of this tribe, however, began to decline about 1130, and was extinguished by the Almohades (q.v.), a fanatical sect of Mohammedans, who landed in Spain in the middle of the 12th c., and conquered the territories of the Mohammedans in Spain. During the reign of the third monarch of this dynasty took place the battle between the combined forces of Castile, Leon, Navarre, Aragon, and Portugal, with the Moors, in which the former gained the most celebrated victory ever obtained by the Christians over their Moslem foes, the latter losing, according to the account transmitted to the pope, 100,000 killed and 50,000 prisoners. This sanguinary conflict, fought on the plains of Tolosa (*las navas de Tolosa*), July 16, 1212, broke the Almohade power in Spain, as that of Salamanca (July 22, 1812), almost exactly six centuries afterward, did the more formidable strength of Napoleon. On the fall of the Almohades, Mohammed-ben-Alhamar, the king of Jaen, rose to the first place among

the Mohammedan princes, and founded (1238) the *kingdom of Granada*. The king of Granada was speedily forced to become a vassal of Castile, and from this period all danger from Moslem power was over. The rest of the history of the Spanish kingdoms before their union is undeserving of a detailed account. The Castilian court was the scene of almost constant domestic strifes and rebellions, varied with a campaign against Granada or in favor of the monarch of that kingdom against his rebellious vassals; the only prominent monarchs of this kingdom being Ferdinand III., who confined the Moorish dominion to the s. of Andalusia, Alfonso X. (q.v.), Alfonso XI., Peter the Cruel (q.v.), and queen Isabella, the last sovereign of Castile, who succeeded her brother Henry IV., owing to a widespread belief in the illegitimacy of the latter's daughter. Aragon, on the other hand, was almost wholly free from intestine dissensions, doubtless owing to the interest taken by the Aragonese monarchs in Italian politics; of these sovereigns Jayme I. (1213-48) conquered Valencia and Majorca, and, first of all the Aragonese kings, received a voluntary oath of allegiance from his subjects; Pedro III. (1248-85), who obtained Sicily (1282), Minorca, and Iviza; Jayme II., who conquered Sardinia and Corsica; Alfonso V. (1416-68), who conquered Naples; and Ferdinand II. (q.v.), the Catholic, the last sovereign of Aragon, who, by marriage with Isabella, queen of Castile, in 1469, the conquest of Granada in 1492, and that of Navarre in 1512, united the whole of Spain (and French Navarre) under one rule.

The year 1492, in the reign of Ferdinand and Isabella, witnessed also the discovery of America, as well as the capture of Granada. Spain had now become consolidated into one empire, from the Pyrenees to the strait of Gibraltar, civil wars were at an end; and a splendid continent, teeming with riches, had been opened up for Spanish adventure and enterprise. But, as the most active spirits among the Spaniards now crowded to the new world, the soil of Spain, and its mineral treasures, both inexhaustible sources of wealth, were neglected for the riches of the fancied El Dorado, where, as was everywhere believed, gold was more plentiful than iron was in the old country. Besides the drain upon the country from emigration, the expulsion of the Jews and Moors was productive of the direst results; and the decline of the splendid Spanish empire, upon which the sun even then never set, may be said to have had its origin in the event which raised the country to the height of its magnificence. Charles I. (Charles V. of Germany, q.v.) succeeded Ferdinand, and in his reign Mexico (q.v.) and Peru (q.v.) were added to the possessions of Spain. Philip II. (q.v.), by his enormous war expenditure and maladministration, laid a sure foundation for the decline of the country. Industry, commerce, and agriculture, may be said to have been extinguished at the expulsion of the Moriscos (see Moors); and the reigns of Philip III. and Philip IV. witnessed a fearful acceleration in the decline of Spain by the contests with the Dutch, and with the German Protestants in the thirty years' war, the intermeddling of Olivarez (q.v.) in the affairs of northern Italy, the rebellion of the Catalans, whom the minister wished to deprive of their liberties, the wars with France, and the rebellion of Portugal (1640), which had been united to Spain by Philip II. That of Charles II. was still more unfortunate, and the death of the latter was the occasion of the war of the Spanish succession (see SUCCESSION WARS). Philip V. (q.v.) was the first of the Bourbon dynasty who occupied the throne of Spain. Under Charles III. (1759-88), a wise and enlightened prince, the second great revival of the country commenced; and trade and commerce began to show signs of returning activity. During the inglorious reign of Charles IV. (1788-1808), who left the management of affairs in the hands of the incapable Godoy (see ALCUDIA), a war (1796-1802) broke out with Britain, which was productive of nothing but disaster to the Spaniards, and by the pressure of the French another arose in 1804, and was attended with similar ill success. Charles abdicated in favor of his eldest son, the prince of Asturias, who ascended the throne as Ferdinand VII. Forced by Napoleon to resign all claims to the Spanish crown, Ferdinand became a prisoner of the French in the year of his accession, and in the same year Joseph, the brother of the French emperor, was declared king of Spain and the Indies, and set out for Madrid, to assume the kingdom thus assigned to him. But before this time, an armed resistance had been organized throughout the whole country. The various provinces elected juntas or councils, consisting of the most influential inhabitants of the respective neighborhoods, and it was the business of these juntas to administer the government, raise troops, appoint officers, etc. The supreme junta, that of Seville, declared war against Napoleon and France on June 6, 1808. In July, England, on solicitation, made peace with Spain, recognized Ferdinand VII. as king, and sent an army to aid the Spanish insurrection. Joseph, on July 9, entered Spain, defeated (through his lieutenant Bessières) the Spaniards at Rio Seco, and entered Madrid on the 20th; but the defeat of Dupont at Baylen by the veteran Spanish gen. Castaños, somewhat altered the position of affairs, and Joseph, after a residence of 10 days in his capital, was compelled to evacuate it, and retire n. to Vitoria. The noble defense of Palafox of the city of Zaragoza against Lefebvre, and the return of the marquis de la Romana with 7,000 regular troops who had been wiled from the country by Napoleon, did much to inspire the patriots. On July 12, 1808, sir Arthur Wellesley, afterward duke of Wellington (q.v.), at the head of the British auxiliary force, landed (Aug. 5) at Mondrago bay, and began the peninsular war by defeating the French at Roliza and Vimiera (q.v.); but in spite of his opposition the convention of Cintra was signed, and the French transported to their own country. In Nov., 1808, Napoleon, who had been preceded by Ney (q.v.) with 100,000 men, entered Spain, and at once assumed the command. For a time his armies were completely successful. Soult utterly routed the Spanish gen. Bel-

vedere, Nov. 10, and annihilated Blake at Reynosa on the 13th. Castaños and Palafox were routed at Tudela by Lannes, and in the beginning of December, Napoleon entered Madrid. At this time, the British forces were under the command of sir John Moore (q.v.), who, aware of his great inferiority in numbers and resources, retreated west from Salamanca, whither he had come to assume the command of the allied forces, and reached Coruña (q.v.) on Jan. 11, 1809. On April 22, Gen. Wellesley arrived in Portugal, and at once commencing operations, drove Soult from Oporto, and took possession of Portugal; then, favored by the disunity of action which subsisted between the three or four French armies who held Spain, he directed his attacks upon the army of the center, retreating when any of the others came to its aid, and by dint of masterly generalship and bold enterprise, succeeded, after four campaigns, in driving the French from the country. To this result, the co-operation of the Portuguese and of the Spanish *guerrillas*, the revengeful hatred of the peasantry toward their tyrannical oppressors, and the drafts from the Spanish armies so frequently made by Napoleon for his wars in central Europe, largely contributed. See WELLINGTON, SOULT, VICTOR, etc. Napoleon, loath to lose his hold of the peninsula, sent Soult, his most trusted gen., to stop the ingress of the British into France; but the battles of the Pyrenees (July 24—Aug. 1, 1813), and of the Nivelle, Orthez, and Toulouse, in the beginning of 1814, brought to a victorious conclusion this long and obstinate contest.

In 1812 a constitution, on the whole liberal, had been devised for the country by the cortes of Cadiz. It was abrogated, however, by Ferdinand VII. (q.v.), who treated the subjects who had shown such devoted loyalty to him with infamous ingratitude, and obtained the aid of France to establish despotism. The reign of his daughter, Isabella II. was disturbed by the Carlist rebellion, 1834–39, in which the British army under sir De Lacy Evans aided the queen. See CARLOS DE BOURBON. The next event of importance was the contest between Espartero (q.v.), the regent, and the queen-dowager Christina, for the supreme power during the minority of the queen. Espartero was successful from 1840 to 1843, but was compelled to flee before O'Donnell and Narvaez, and was not restored till 1847. The constituent cortes of 1837 drew up a new constitution, based on that of Cadiz. In 1845, another constitution was promulgated by Narvaez (q.v.), duke of Valencia. Frequent changes of ministry, occasional revolts, the banishment of queen Christina (1854), the formation of the O'Donnell ministry (1858), the war with the Moors (see MOROCCO), the annexation of St. Domingo in 1861, and the quarrels between Spain and her former colonies, Peru (1864–65) and Chili (1865), were the most marked events in the more recent history of Spain prior to 1868. In 1868 Isabella was driven from the throne by a general revolt; and the cortes, in Nov. 1870, elected prince Amadeo of Italy to be king. Finding the task of ruling constitutionally hopeless, Amadeo abdicated early in 1873, upon which the form of government was changed into a republic. During the remainder of 1873, and the whole of 1874, Spain was the scene of general anarchy and much bloodshed, resulting from the mutual opposition of the Carlists and republicans. On Dec. 31, 1874, Alphonso, son of the ex-queen Isabella, was declared king of Spain. He d. Nov. 25, 1885, and queen Christina became regent, acting in behalf of the infant king Alphonso XIII., born 1886. In 1895 a revolt broke out in Cuba. The previous revolt in 1881 had failed to secure independence, but had resulted in certain concessions and promises from Spain. Cuba became a Spanish province with the right of sending to the Cortes 30 representatives and 14 senators. In the opinion of a large part of the population these reforms did not better the condition of the island. There were complaints that the interests of Cuba were sacrificed for the benefit of the home government, that her offices were filled with Spaniards and her government corruptly administered. The seat of the revolt was, as in the earlier movement for independence, centered in the eastern and more sparsely populated provinces. The force of the insurgents soon reached a strength of 25,000. In the fall of 1895 a constituent assembly and a provincial government was established under Cisneros. Spain made strenuous efforts to put down the rebellion, and before the year ended had an army 117,000 strong in Cuba. The command was given to one of Spain's most eminent soldiers, Martinez Campos, who was authorized to promise administrative reforms. The policy of the insurgents, under their leaders, Gomez and Maceo, was to conduct a guerilla warfare, avoiding open fights and wearing out the enemy by delays. Spanish troops made little headway against the rebels and suffered heavily from the heat and from yellow fever. In 1896 Campos was recalled and General Weyler was sent to take his place. Much sympathy with the Cuban cause was manifested in the United States, and, in spite of that government's assurances of friendship toward Spain and neutrality toward the combatants, money and arms found their way from that country to Cuba. Great indignation was expressed in Spain against the people and government of the United States, the Queen Regent declaring that Spain would have stamped out the revolt in a short time if it had not been for the false hopes entertained by the insurgents of aid from a great power. For an account of the relations between the United States and Spain during the war, see the article UNITED STATES. The insurgent leader Maceo (q. v.) was killed in December, 1896.

In the spring of 1897, General Weyler announced that the western part of the island was completely pacified and the Queen Regent, on April 20, signed a decree instituting reforms in the government of Cuba. These included the establishment of an administrative council consisting of over 30 members, of whom the majority were to be elected by the Cubans, and the rest chosen by the Spanish government. The supreme control of affairs in the island was to be in the hands of this council. Later in 1897 it was evident that the western part of Cuba was not as completely subdued as General Weyler

had declared and the reinforcement of the already large Spanish army in the island was regarded as necessary. Weyler was recalled, and the command in Cuba assigned to General Blanco. In the fall of 1897 the Spanish premier, Canovas del Castillo, was assassinated by an anarchist. He was succeeded by Azcarragua, but the conservative government was unpopular on account of the Cuban matter and other difficulties, and the liberals were gaining ground. For an account of the revolt in the Philippine islands, see the article PHILIPPINE ISLANDS.

SPALATO (often erroneously called SPALATRO; in Illyric, SPLIT), an important seaport of Dalmatia, empire of Austria, is finely situated on a promontory on the eastern coast of the Adriatic. It originated in the famous palace of Diocletian, built in the 3d century. As this immense structure (which occupied 12 years in building) stood not far from the city of Salonæ, the great bulwark of Roman power in Dalmatia, it was called *Salonæ palatium*, briefly written *S. palatium*. When Salonæ was conquered by the Avars in the 7th c., the inhabitants fled for refuge to the fortress-palace of the emperor, where they laid the foundations of a new town, corruptly named *Aspalathum*, whence the modern *Spalato*. Even yet the greater part of the old town is compressed within the limits of the ancient palace, a considerable portion of whose walls still remain. The best-preserved parts of the palace are the supposed mausoleum of Diocletian, transformed in the 7th c. into a Christian cathedral, and the temple of Æsculapius, now a baptistery dedicated to St. John. Modern Spalato is divided into an old and a new town, the former consisting mainly of narrow, crooked, and dirty lanes; the latter more agreeable and open. It is the seat of a bishop, has a fine harbor, and carries on an active trade in grain, cattle, horses, oil, wine and liqueurs, and is the principal emporium for goods passing from Italy overland into Turkey. Pop. '90, 15,697.

SPALAX. See MOLE-RAT.

SPALDING, a co. in w. Georgia, bounded on the w. by Flint river; crossed by several railroads operated by the Central of Georgia railroad; 189 sq. m.; pop. '90, 13,117. The surface is undulating, the soil is fertile. The main productions are cotton, corn, wheat, cattle, and swine. Co. seat, Griffin.

SPALDING, HENRY H., 1810-68; b. Ky.; studied at St. Mary's and Bardstown; graduated at the Propaganda in 1837; was pastor of St. Joseph's Roman Catholic church at Bardstown in 1844; of the church in Louisville in 1849; and was vicar-general.

SPALDING, JOHN FRANKLIN, D.D., b. Maine, 1828; graduated at Bowdoin college in 1853, and at the general theological seminary, New York, in 1857; was minister of St. James's church, Protestant Episcopal, Oldtown, Me., 1857-59; rector of Grace church, Providence, R. I.; rector of St. Paul's church, Erie, Penn., 1862-74; elected missionary bishop of Colorado (1873); consecrated bishop in 1873. In 1874 he removed to Denver, Col. He published *The Threefold Ministry* (1864); *Manual of Prayers* (1872), etc. He has done much to advance the educational work of the church in Colorado.

SPALDING, JOHN LANCASTER, D.D., b. Lebanon, Ky., 1840; was educated at Mt. St. Mary's coll., and at the univ. of Louvain, Belgium; was ordained a Rom. Catholic priest; and was appointed sec. and chancellor of the diocese of Louisville, and later bp. of Peoria. He edited the Young Catholic series of school-books, and wrote *Life of Most Rev. M. J. Spalding, Archbishop of Baltimore*, and a number of essays and reviews.

SPALDING, MARTIN JOHN, D.D., 1810-72; b. Ky.; educated at St. Joseph's, Ky., and Rome in 1834; became Roman Catholic bishop of Louisville in 1849; succeeded Dr. Kenrick as archbishop of Baltimore in 1864. He has published *Miscellanies*; *Early Catholic Missions of Kentucky*; *Lectures on the General Evidences of Christianity*; *History of the Protestant Reformation* (2 vols). He edited with an introduction and notes the Abbé Darras's *History of the Catholic Church*, 4 vols. He convened the second national council at Baltimore; was an active member of the Vatican council, 1870-71, and favored the doctrine of papal infallibility.

SPALLANZANI, LAZARO, a celebrated anatomist and naturalist, was b. at Scandiano, in Modena, Italy, Jan. 12, 1729. After a careful education, he took clerical orders; and in 1764 he was appointed to the chair of logic, metaphysics, and Greek at Reggio; but soon after this he obtained a chair at Modena, and, refusing the tempting offers made him by the universities of Parma and Coimbra, and the academy of St. Petersburg, gave himself up to the study of natural history. His attention was directed to the doctrine of generation propounded by Needham and Buffon, which, after careful study and experiment, he overturned. He then turned his attention to the circulation of the blood, and was the first to follow its course through the intestinal tube, the liver, spleen, ventricles, pulmonary organs, etc.; "established," according to Senebier, "the propulsive power of the heart over the blood in the various vessels, demonstrated that the heart never wholly empties itself, explained the various causes which retard the circulation, and the obstacles produced by the weight of the blood." On the re-establishment of the university of Pavia, Spallanzani was appointed (1768) professor of natural history, and keeper of the museum, which he greatly enriched with fishes, crustacea, and testacea, the fruits of his numerous excursions. In 1785, refusing the chair of natural history at Padua, which had been so admirably filled by Vallisnieri, he accepted the proposal of the archduke Ferdinand to accompany, with doubled salary, the Austrian ambassador to Constantinople (Aug. 22, 1785); and during a residence of 11 months in Turkey found ample materials for study and observation. In 1788 he visited Naples whilst

Vesuvius was in eruption, the Lipari isles, and Sicily, in restless prosecution of his scientific labors, and then retired to Pavia, where, refusing the tempting offers of the French directory, he spent the remainder of his life, prosecuting his scientific researches amid bodily sufferings, and died of apoplexy, Feb. 12, 1799. His works, many of the more valuable of which have been translated into English, are too numerous to mention; but a complete catalogue of them, along with a biography, will be found in the *Bio-graphie Médicale*, vol. vii. See also, for the result of his labors, the *Eloge*, by M. Alibert, in the *Mémoires de la Société Médicale d'Emulation*.

SPAN, a natural measure of length, being the distance between the tips of the thumb and middle finger, the hand being stretched as much as possible. This space averages about 9 in., and the term came to denote a measure of 9 inches.

SPANCELED, in heraldry, a term applied to a horse two of whose legs are fettered by a log of wood.

SPANDAU, a t. of Prussia, in the province of Brandenburg, is situated at the confluence of the Havel and Spree; 9 m. w.n.w. of Berlin. Through extensive improvements in its fortifications and the construction of numerous detached forts, Spandau has been made a stronghold of the first rank for the protection of Berlin, has a citadel surrounded by water, with a garrison of upwards of 3000 men, and is a military depot. Spandau carries on manufactures of arms, gunpowder, woollens, etc., and has an active transit-trade as a station on the Berlin and Hamburg railway. Pop. '95 (with garrison), 55,841. It is one of the oldest towns in the middle mark of Brandenburg, and was long the residence of the kurfirsts of the Hohenzollern house.

SPANG'ENBERG, AUGUST GOTTLIEB, PH.D., 1704-92; b. Prussia; graduated at Jena, 1726, and lectured there; appointed adjunct professor and assistant superintendent of the orphan house, Halle, 1731; assistant to count Zinzendorf, 1734; founded the first Moravian settlement in America, at Savannah, Ga., 1735-39; returned to Europe and secured the settlement of Bethlehem, Penn.; organized the first Moravian society in England, at London, 1741; consecrated bishop, 1744, and went to America where for 18 years he superintended the whole Moravian work, making frequent journeys to the Indians, and being adopted into the Oneida nation; was a member of the college of bishops and elders to govern the whole Moravian church, 1762-90; 1764 was appointed supreme inspector in upper Alsace; and, in 1789, president of the general directory. His principal works are, *Life of Zinzendorf*, and an exposition of Christian doctrine which is the standard among the Moravians.

SPANHEIM, EZECHIEL, 1629-1710; b. Switzerland; educated at the Geneva university, where in 1651 he was appointed professor of elocution. He was tutor to the son of the elector palatine Charles Louis, and was employed by him in political missions, and also by the elector of Brandenburg, by whom he was made a baron. After the peace of Ryswick he was sent to France and England. He wrote a number of commentaries on and translations of classical authors as well as some numismatic treatises.

SPANIEL, a kind of dog of which there are many breeds, differing considerably in size and other characters. None of the spaniels are large; some are amongst the smallest of dogs. Some are used for sporting purposes, others are merely kept as pets and companions. All of them are lively, playful, docile, and affectionate in a high degree. The spaniel is ever petitioning for regard, and shows boundless joy on receiving marks of kind attention. The **ENGLISH** or **SUSSEX SPANIEL** is of an elegant but moderately stout form; with very large pendant ears, of which the hair is very long; the muzzle rather broad; the tail bushy; the body covered with long silky hair; the colors various, very often liver-colored and white, or red and white. The name spaniel is said to indicate the introduction of this kind of dog into England from Spain. In the days of falconry spaniels were much used for starting the game. The **COCKER** (q.v.), the **SPRINGER** (q.v.), and the **BLenheim dog** (q.v.) are different kinds of spaniels. The **KING CHARLES'S SPANIEL** is a beautiful black and tan breed, almost as small as the **BLenheim dog**, and derives its name from Charles II., who took great delight in dogs of this kind. The **WATER SPANIEL** is one of the larger breeds. It has comparatively hard hair, and is distinguished by its readiness to pursue game by swimming. It is much used in decoy ponds to drive ducks into the net.

SPANISH FLY. See **CANTHARIS**.

SPANISH GRASS. See **PAPER**.

SPANISH LANGUAGE AND LITERATURE. The Spanish language is one of the Romanic tongues, and, like the others, originated in the *lingua Romana rustica*. See **ROMANIC LANGUAGES**. The earliest of the different Spanish dialects that assumed a literary form was the Castilian, which gradually became, and has continued to be, the classic dialect of the nation. It finally blends a certain soft, lingering richness of cadence with an occasional sonorous majesty of expression, and on the whole may be considered one of the most beautiful of the European tongues. The course of Spanish conquest has also led to its establishment in Mexico, Central America, Cuba, Porto Rico, the greater part of South America, the Canary isles, and the Philippines. See the *Grammar and Dictionary* published by the Spanish Academy (1771); the grammars of Keil (Leip. 1837); Fuchs (Berl. 1837); Wiggers, and Schele de Vere (New York, 1854). The best material for a historical grammar is furnished by Diez in his *Grammatik der Romanischen Sprachen*. The best Spanish dictionaries, besides that of the Academy, are Cabrera's

(Mad. 1837); the Spanish-German by Seckendorff (3 vols. Hamb. 1823), and the Spanish-English of Neumann and Barette (re-edited by Velazquez, New York, 1852).

Literature.—The literature of Spain may, in a superficial sense, be regarded as commencing under the auspices of the Romans, for Lucan, Seneca, and other eminent Latin authors, were at least Spanish by birth; and, if we please, we may further look upon the Christian ecclesiastical writers of the Gothic period as the second link in the historical chain. But in the proper sense of the term, the literature of these two periods is no more Spanish—i.e., a national—than an English book by an Anglo-Indian is to be held as a portion of Hindu literature, or the sermons preached by a missionary to South Sea islanders are to be quoted as specimens of the literature of the Pacific. Passing over, then, the various developments of non-national literature in Spain—pagan Latin, ecclesiastical Latin, Arabic and Jewish—we come down to the 12th c., and then, for the first time after the gradual formation of a Spanish language, begin to notice the growth of something like a Spanish literature. Epic and didactic poems appear, written in Castilian verse, and full of strong national sentiment. The oldest of these is the *Poema del Cid* (see *CID CAMPEADOR*), of which only a single MS. exists. This MS. contains three other poems: *The Book of Apollonius, Prince of Tyre*; *The Life of our Lady, St. Mary of Egypt*; and *The Adoration of the Three Holy Kings*, the authorship of which (as of the *Poema del Cid*) is unknown. Other productions of this first period are the rhymed *Lives of the Saints*, by Gonzalo of Berceo (died about 1260); and the anonymous poem, *Count Fernan Gonzalez*, which, like the *Poema del Cid*, paints the earnest and picturesque struggle between the Moors and Spaniards. In all of these we trace the influence either of the church or of the chivalric poetry of France; but they maintain, nevertheless, a distinctively national and independent character. A great impulse was given to the artistic development of Spanish literature by Alfonso the wise of Castile (q.v.), who substituted Spanish for Latin in the courts of law, and fostered in many ways the growth of the national language. He is regarded as the founder of Spanish prose, his chief work in this department being the compilation of a series of codes, of which the most memorable is *Las Siete Partidas*, and a translation of the Bible into Spanish. Subsequent princes walked in his steps, and achieved an honorable reputation both as authors and patrons of literature, conspicuous among whom was the Infante Don Juan Manuel (died 1347), whose *El Conde Lucanor* (count Lucanor) is a collection of 49 tales, apologies, etc., from oriental sources, and wearing an oriental aspect. The most remarkable Spanish poet of the 14th c. is Juan Ruiz, arch-priest of Hita (died 1351). His pieces, composed in a great variety of measures, number some 7,000 verses, and include religious and love songs, fables, pastorals, etc. The didactic tendency is particularly visible in the *Danza General de la Muerte* (dance of death).

The second period of Spanish literature embraces the later portion of the middle ages, and is marked by the presence of lyric poetry in considerable quantity, alongside of the didactic. It seems to have been inspired by the strains of the provençal poets settled at the court of the counts of Barcelona, and always continued to be more courtly than national. The most complete collection of this lyric poetry is the *Concionero general* of Fernand del Castillo (Valencia, 1511; 10th edit., 1573), which contains the names of 136 authors, among which may be mentioned those of the marquis of Villena, and the marquis of Santillana, the three Manriques, Macias, Sanchez de Badajoz, Alonzo de Cartagena, Diego de San Pedro, and Fernan Perez de Guzman. Against this court-poetry, however, a strong reaction took place, the national spirit re-asserting itself vigorously in ballads, chronicles, romances of chivalry, and the drama. The best collection of the ballads (about 1000 in all) is to be found in the *Romancero general* (13 vols., 1605-14); of the chronicles (half-genuine, half-fabulous narratives of ancient Spanish heroes), the best are those of Ayala, of Juan Nuñez de Villaizán, the *Chronicle of the Cid*, and the *Chronicle of the Travels of Ruy Gonzalez de Clavijo*; of the romances of chivalry, the most celebrated is the *Amadis de Gaul*, parent of innumerable others (see *AMADIS*); and of the drama, among the first specimens are the pastoral plays of Juan de la Enzina, and the *Celestina* of Fernando de Rojas.

The third period, extending from the 16th to the 18th c., is the most splendid and productive in the annals of Spanish literature. Under Charles V., Spain became the foremost state in Europe, and the conquest of Naples brought it into close relation with the literature of Italy. The great Italian masters, such as Dante and Petrarch, began to be studied, and Italian measures and poetic forms to be imitated, although the rich, strong, Spanish spirit is never lost. The first of this new school was Juan Boscan Almogaver (died 1543), a brilliant sonneteer: other members of the same school are Garcilaso (q.v.) de la Vega, Diego Hurtado de Mendoza (q.v.), Francisco de Saa de Miranda, and Jorge de Montemayor (author of the once famous pastoral novel of *Diana* (see *NOVELS*), Fernando de Herrera (q.v.), and Luiz de Leon (died 1591), the last two of whom rank as the two greatest lyric poets that Spain ever produced. Gradually, a national drama established itself too. Conspicuous names in this department are Villalobos, Perez de Oliva, and Naharro (about 1517), sometimes regarded as the father of the Spanish drama. The last-mentioned wrote his comedies in the favorite national measure, the *redondillas*, and divided them into three acts. Besides these, we must mention Lope de Rueda, Juan de la Cueva, and Geronimo Bermudez, who cultivated tragedy with success. Among the most eminent prose writers of the first section of

this third period was Geronimo Zurita, author of *Annales de la Corona de Aragon* (Annals of the Crown of Aragon, 6 vols.)—a somewhat critical work, showing a decided advance on the credulous chronicles of the monks; Oliva, whose *Dialogo de la Dignidad del Hombre* (Dialogue on the Dignity of Man) is a fine specimen of elegant literature; and Morales, author of *Discursos* (Essays), relating to practical philosophy; etc.—Cervantes (q.v.) marks, if not exactly a new era, at least a splendid outburst of Spanish genius. It is unnecessary here to criticise the productions of his genius; we may only note, as it were, historically the fact, that his immortal *Don Quixote* put an end to the romances of chivalry—or rather to the extravagant imitations of these that sprung up after the age of chivalry had passed away. Lope de Vega (q.v.), a contemporary of Cervantes, and Calderon (q.v.), gave the national drama a European renown, and had, especially the latter, a host of followers more or less celebrated, among whom are Francisco de Rojas, Agustin Moreto, Fragosa, Diamante, Antonio Hurtado de Mendoza, Juan de la Hoz, Antonio de Solis, and Agustin de Salazar y Torres. The lyric and “epic” poets of this period, which embraces the second half of the 16th, and the whole of the 17th c., are innumerable, but not great. The most notable names are those of the brothers Argensola, and Alonso de Ercilla y Zuñiga (author of *Araucana*, a fine poem on the conquest of Araucania in Chili by the Spaniards). A peculiar form of the novel also appeared, called the “rogues’ novel,” of which the only memorable specimen is the *Guzman de Alfarache* of Mateo Aleman; and even it derives not a little of its importance from the fact that it suggested Le Sage’s *Gil Blas*. In history, the most distinguished names are those of Mariana (q.v.) and Solis.

The fourth period of Spanish literature extends from the accession of the Bourbons (1701) to the present time, and was long marked (like the contemporary literature of Germany) by a servile imitation of French models, and these by no means the best of their kind. This literary ascendancy of France in the first half of the 18th c. over all civilized Europe is a very curious phenomenon, worthy of closer study than it has yet received. The most notable of the Frenchified Spaniards was Ignacio de Luzan, whose *Poetica* (1737) is a thoroughly Gallician performance. His efforts to denationalize the literature of Spain were combated by Garcia de la Huerta and others, and at length a sort of compromise was effected, and the “Salamanca school” emerged into notice. Its founder, Malendez Valdez (b. 1754), was a man of high genius who subordinated his liberal culture to the sovereign control of a patriotic inspiration, and the same qualities are visible in its other members—Iglesias, Noroña, Quintana (q.v.), Cienfuegos, Arriaza, and Gallego. The great peninsular war, and the subsequent political movements in Spain, had a powerful effect in stirring up anew the elements of nationality, and the present century can show a lengthened list of names both in prose and poetry. We can only afford space for a few: Tapia, Maury, Juan Bautista Alonso, Jacinto de Salas y Quiroga, Espronceda, Serafin Calderon, Zorrilla, Hartzenbusch, R. de Campoamer, Santos Lopez Pelegrin, Villergos, and G. Gomez de Avellaneda, in poetry; Saavedra, Mora, Zorrilla Gregorio Romero y Larrañaga, Manuel de Santa Ana, Alarcon, in fiction; Leandro, Fernandez Moratin, in the drama; Ulloa, Muñoz, Capmany, Ferreras, Quintana, Navarrete, Clemencin, Torreno, and Maldonado, in history; Jovellanos, Arguelles, Castelar, Marina, Donoso Cortes, Martinez de la Rosa, etc., in political oratory.

Spain has not as yet achieved great results in any departments of science, either physical, mental, or moral; but of late years she has turned her attention seriously to scientific studies, and several admirable treatises in jurisprudence, political economy, medicine, philosophy, philology, and geography have been produced.—See Bouterwek’s and Sismondi’s *Histories of Spanish Literature*; and above all, Ticknor’s work on the same subject (3 vols., New York; 1849–54), which has been translated into Spanish.

SPANISH MACKEREL (see MACKEREL). The name Spanish mackerel is applied to different kinds of fishes; in the United States more particularly to the *cybium maculatum*, a slender, compressed, fusiform fish, having many rays in the dorsal and anal fins. Color bluish green above, a beautiful satin white below, with yellowish spots on the back and sides. As found in the market they vary much in size, weighing usually from one and a half to four pounds, although they are sometimes caught weighing seven or eight pounds. They are natives of tropical seas, but they range along the Atlantic coast from Brazil to cape Cod. A noted locality for them is the Chesapeake bay, where they are much larger generally than those which go farther north. They are among the very finest of fish for the table, and are peculiarly adapted to broiling, being juicier than almost any other fine fish, much more so than other kinds of mackerel. Along the coast of Cornwall, England, the name of Spanish mackerel is applied to the *scomber colias*, which much resembles the common mackerel, *scomber scombrus*, having much fewer rays in the dorsal and anal fins than the Spanish mackerel of the western Atlantic coast, and being also much smaller. See MACKEREL. The common mackerel is an important article of commerce. They are split and salted in small barrels and small tubs called kits, and assorted and numbered according to their quality, No. 1, No. 2, and No. 3, No. 1 being the largest and finest.

SPANISH MAIN (i.e., *main-land*), a name generally given during the 16th c. and the earlier part of the 18th to the n.e. coast of South America, from the Orinoco to the isthmus of Darien, as also to the contiguous southern portion of the Caribbean sea,

traversed by the Spanish treasure-ships. The name occurs very frequently in connection with the history and exploits of buccaneers (q. v.).

SPANISH POLITICAL PARTIES. See **POLITICAL PARTIES, SPANISH.**

SPANISH TOWN, until 1871 capital of the British possession of Jamaica (q. v.), on the right bank of the Cobre, and 10 m. w. of Kingston. It contains several important public institutions, is ill built and unhealthy and contains, '91, 5019 inhabitants.

SPANISH WINES. Of all the vegetable productions of Spain the vine is the most important, the lands being almost everywhere favorable to its culture. The excess of the vintage above the quantity consumed in the country forms a considerable branch of the export trade. In 1889 Spain exported to France, the chief consumer alone, 160,616,000 gallons. The wines grown in almost all parts of the country have much taste and bouquet, and great strength and durability, if subjected to proper treatment. In the preparation of white dry fortified wines, such as sherries, and in the confection of some sweet wines, such as Malagas, the Spaniards excel all other nations. Andalusia, an extensive region in the s., contains the belt of vineyards producing the *vino secco* and the *abocado*; there also is Rota, famous for its red wine. From this province come the wines of Moguro, or Moguer, Negio, Rancio, and Seville. Catalonia yields annually 20,000 butts of wine, mostly red. The Catalan was formerly shipped largely to South America, and much of it is at present exported to England and sold as Spanish port. Valencia produces annually 100,000 butts of wine, from which by distillation 20,000 butts of spirits are manufactured. The best qualities are grown on the hill-sides; the greatest quantities in the plains. Aragon produces dark-colored strong-bodied wines of good taste and flavor from the celebrated vines, the Grenache of Sabayes and the Carineña, and delivers them up to the trade of Saragossa. Granada, with its famed Malaga, produces wines and raisins. In the mountains of Malaga the vine attains almost tropical luxuriance, and bears three harvests every year. Galicia produces some good wine for exportation, such as Ribaclavia and Tuy, but the climate of Navarra is not favorable to viticulture, and the produce of Roncesvalles is insufficient to supply local demand. Biscaya, the most northern province of Spain, produces much wine. New Castile, with its renowned La Mancha, produces very agreeable wines, such as the muscat of Juncaral, near Madrid. Near these are the wines of Spanish Tagus, from Arganda del Rey, above Madrid, to Talavera de la Reyna. Murcia produces thick rough wines, and the island of Majorca produces a malvoisie wine, which is exported by way of Palma. Minorca produces a red dark wine around Alcyor, and the "Albafiora," a light white wine of much bouquet. The Spanish governments have frequently encouraged the production of wine.

SPANKER, a large quadrilateral sail, with parallel sides, set between the gaff and boom of a ship. Its fore-leech is attached by rings to the mast. The spanker is a fore-and-aft sail of great importance in bringing the vessel to the wind.

SPAR (Ger. *Spath*), a term used by miners to denote any bright crystalline mineral, and which has been adopted by mineralogists in the names of a number of minerals, as calcareous spar, fluor spar, etc., in which, however, it has no proper generic significance.

SPARIDÆ, a family of acanthopterous fishes, having a general resemblance to the perch family—a single dorsal fin, which is not protected by any scales, and of which the anterior rays are spinous, the pectoral and ventral fins sharp-pointed, the tail-fin notched; the gill-cover shining, without proper spines or denticulations; the palate destitute of teeth; the scales large, broader than long, and generally thin. There are several sections of the family distinguished by the teeth, which in some are all small and card-like, while others have trenchant, conical, and round molar teeth, variously arranged. The greater number inhabit the seas of the warm parts of the world; many species are found in the Mediterranean; a few on the coasts of Britain. Among the British species are the gilthead (q. v.), and several species of different genera, known by the common name of sea bream (q. v.). The sparidæ are generally good for food, and some are highly esteemed. Among them are *sargus* of the Mediterranean (*sargus Rondeletii*), much valued by the ancient Romans, and the sheep's head (*sargus ovis*) of the North American seas, which commands a very high price in the New York market.

SPARKS, JARED, American historian, was b. at Willington, Conn., May 10, 1789; graduated at Harvard university in 1815; became tutor in mathematics and natural philosophy, and one of the conductors of the *North American Review*. In 1819 he was settled as a Unitarian minister at Baltimore, when he wrote *Letters on the Ministry, Ritual, and Doctrines of the Protestant Episcopal Church*. In 1821 he established a periodical called the *Unitarian Miscellany and Church Monitor*, in which he first published his *Letters on the Comparative Moral Tendencies of the Trinitarian and Unitarian Doctrines*. In 1823 he edited six volumes of essays and tracts on theological subjects, and, abandoning the pulpit, became for seven years sole editor of the *North American Review*. In 1828 he published a *Life of John Ledyard, the American Traveller*; and from 1834 to 1837 edited at Boston 12 octavo volumes of the *Writings of George Washington*. This important national work was followed by the *Diplomatic Correspondence of the American Revolution* (12 vols. 8vo, Bost. 1829-30), and the *Life of Gouverneur Morris* (3 vols.

8vo, Bost. 1832). At this period he commenced the *American Almanac of Useful Knowledge*, and began also his *Library of American Biography*, first issued in two series of 10 and 18 vols. 18mo. In 1840 was published his collection of the *Works of Benjamin Franklin* (10 vols. 8vo), after which he visited Europe to collect materials for his *Correspondence of the American Revolution* (4 vols. 8vo, 1854). He also wrote, in 1852, two pamphlets in answer to Lord Mahon, on the *Life of Washington*. Besides these multifarious literary labors, combining laborious research with clear arrangement, a simple style and accurate statement, he filled, from 1839 to 1849, the McLean chair of history, and from 1849 to his departure for Europe in 1853, that of president of Harvard university. Sparks died Mar. 14, 1866.

SPARROW, *Passer* or *Pyrgita*, a genus of birds of the family *fringillidae*, having a strong conical bill, the upper mandible slightly curved, the lower mandible compressed and shorter than the upper, the nostrils partly concealed by the short feathers at the base of the bill, the legs moderately long and stout, the claws sharp and curved, the tail moderately long, and nearly even at the tip. The species are not very numerous, and are exclusively found in the old world. The **COMMON SPARROW**, or **HOUSE SPARROW** (*P. domesticus*), plentiful everywhere in the British islands, and too well known to need description, is found also throughout Europe, abounding particularly in the northern countries, from which its range extends eastward into Siberia, and southward to the n. of Africa and of India. Of all British birds the sparrow is the boldest in its approaches to man. Town sparrows are not mere visitors from the neighboring country, but constant inhabitants of the town itself, with the smoke of which their plumage is begrimed. The sparrow in its best plumage is not a very beautiful bird, nor has it such elegance of form as many others of the finch tribe; it has no melodious song, but its habits are interesting, and its frequent lively chirp pleasing. Sparrows often congregate in great flocks, particularly in autumn, when they find rich supplies of food in the ripened grain. The sparrow is one of the most omnivorous of birds. Animal and vegetable food seem equally acceptable to it. During summer vast numbers of insects and their larvæ are devoured by sparrows, and in this way they make amends for their plunder of the grain in autumn, which they begin as soon as it is sufficiently ripened, and continue as long as there are sheaves in the field. Their depredations have induced many farmers to use means for their destruction. They are good to eat, though little used for this purpose in Britain. It is otherwise in France, where all the small birds are sought after as articles of food. But the destruction of sparrows may be carried too far; and in France it has been followed by an increase of caterpillars, vastly more injurious to crops than the sparrows themselves. The sparrow makes a very inartificial nest, collecting a quantity of hay, or some similar material, in a hole of a wall, and lining it with feathers; sometimes, but more rarely, building a rude dome-shaped nest in the higher branches of a tree. Apart from the habitations of man, which it so much frequents, it often builds in crevices of rocks, or in cliffs on the sea-coast, or under the shelter of the nests of rooks, one rook's nest sometimes covering several nests of sparrows. Several broods are produced in succession, and the breeding season is prolonged over the whole summer, one brood succeeding another. The summer plumage of the sparrow is more brilliant than that of winter, and the female is of more sober plumage than the male, exhibiting indeed almost no variety of color.—The **TREE SPARROW** (*P. montanus*), the only other British species, is very similar to the common sparrow, but of rather smaller size. It is also a widely distributed bird, frequent over great part of the old world. It is rarely seen in towns.—In Italy the common sparrow is rare to the s. of Piedmont; and another closely allied species (*P. cisalpina*), takes its place, very similar in its habits as well as in its characters.—In America there are numerous species of *fringillidae*, popularly known as sparrows, of which the **WHITE-THROATED SPARROW** (*zonotrichia albicollis*) is most nearly allied to the true sparrows. The nostrils are in a small groove, and the tail is slightly forked.—The hedge sparrow (q.v.) is a bird very different from the true sparrows.—The name sparrow is popularly given in different parts of the world to many different birds, chiefly *fringillidae*.—The bird called sparrow in the English translation of the Bible is a species of thrush.

SPARROW-HAWK, *Accipiter* or *Nisus*, a genus of *falconidae*, ranked among the ignoble birds of prey (see *FALCONIDÆ* and *FALCONRY*). The bill is curved from the base, short, and compressed; its upper ridge rounded and narrow; the cutting margin of the upper mandible with a distinct festoon. The wings are short; the legs long, slender, and smooth. Only one species is British—the **COMMON SPARROW-HAWK** (*A. nisus*, *A.* or *N. fringillarius*), a small hawk, only about 12 in. in length, a considerable portion of the length belonging to the tail. It is found in almost all parts of Britain, and in Asia as far s. as Bengal, and as far e. as Japan. It is not found in America. It very often makes its nest in the deserted nest of a crow. It is a bold, active bird, very destructive to poultry and pigeons. The sparrow-hawk has often been trained for the purposes of falconry, to take land-rails, partridges, and similar game. The sparrow-hawk of Australia (*A. torquatus*) is marked by a collar of numerous bars of white. Its habits are very similar to those of the European sparrow-hawk.—The American sparrow-hawk (*Falco sparverius*), common in most parts of the United States, is similar in size to the European sparrow-hawk, but is rather allied to the kestrel.

SPARTA, anciently **LACEDÆMON**, the capital of Laconia, and the most famous city of Peloponnesus, occupied partly a range of low hills on the right bank of the Eurotas, and partly the intervening plain. Its appearance, even in its palmiest days, was by no means equal to its renown, for though not destitute of handsome public buildings, the severe law ascribed to Lycurgus, that "the doors of every (private) house should be fashioned only with the saw, and the ceiling with the axe," exercised a cramping influence on the development of architecture and of the fine arts generally. The natural defenses of the place, or at least of the long valley of Lacedæmon in which Sparta stood, were so great that it continued unfortified down to the Macedonian period—nearly a century after its mighty struggle with Athens for the hegemony of Greece; and, indeed, it was not regularly fortified till the time of the tyrant Nabis (195 B.C.). Previous to the Dorian conquest the primitive Achæans of Sparta seem to have dwelt in four or five scattered hamlets.—These hamlets were welded into one city, so to speak, by the conquerors, and became known as town-districts. The acropolis of Sparta occupied a hill in the northern part of the city, and was adorned with a temple to Athena (the tutelary goddess of Sparta), plated with bronze, whence it was called the brazen house, and the goddess herself *Chalciecus* (the dweller in the brazen house). On the bronze plates were beautifully sculptured various Greek myths. At the eastern base of the acropolis stood the agora, or market-place, whence streets proceeded to the different quarters of the city. Here stood the public buildings of the magistrates. The agora contained many statues. The principal street in Sparta, called the *Aphetais*, ran s. from the agora to the southern wall, through the most level part of the city, and was lined with a long succession of monumental edifices, chiefly *heroa* and sanctuaries. Along the banks of the Eurotas stretched the *dromos* (race-course), in which were several *gymnasia*, with temples of the Dioscuri, of the Graces, etc., and numerous statues; and still further s. lay a broader level, *Platanistas*, so called from the plane trees that grew there. This was the scene of those mock contests in which the Spartan youth learned to face without fear the realities of war.

The history of Sparta is really the history of Laconia. When the four hamlets, the *Pre-Dorian* Sparta, originated, we have no knowledge; but it cannot be doubted that their inhabitants were Achæans. It is during the rule of the Achæan princes that the events of the famous, but unhistorical, expedition against Troy, forming the subject of Homer's *Iliad*, are described as taking place. Menelaus, husband of Helen, whose flight with Paris occasioned the Trojan war, was king at Sparta, and it was during the reign of his grandson, Tisamenus (according to the legend), that the Dorians (q.v.) invaded Peloponnesus. The *fact* of a Dorian invasion is universally admitted, but of the details, scanty even as they are, we may safely be skeptical. We cannot even be certain of the date of the event, or even of the century in which it occurred. All that is clear is that the native Achæan population were deprived of political privileges, and appear henceforth as *periæci* (q.v.) and Helots (q.v.)—the Dorian conquerors alone forming the historical Spartans. Toward the middle of the 8th c. B.C. the Dorians of Sparta had not only thoroughly established themselves in their new settlement, but had subjugated the whole of the fertile and beautiful vale of Lacedæmon, commonly known as Laconia, and had begun to cherish ambitious views of extending their supremacy over the other Dorian settlements in Peloponnesus, viz., those of Messenia and Argos. Hence originated the Messenian wars (see **MESSENIA**), which terminated (668 B.C.) in the complete overthrow of the Dorians of Messenia, who were reduced by the victorious Spartans to the condition of *periæci*. Similar struggles occurred both with the older Achæan inhabitants in the center of Peloponnesus and with the Dorians of Argos, etc., in which the Spartans were generally successful. The development of their warlike and ambitious character is usually ascribed to the institutions of Lycurgus (q.v.); and whatever we may think of that more than semi-mythical personage, the institutions that go under his name were well fitted to make the Spartans exactly what they figure in history—a race of stern, cruel, resolute, rude, and narrow-minded warriors, capable of a momentary self-sacrificing patriotism (as in the story of the 300 heroes who fell at Thermopylæ), but utterly destitute of the capacity for adopting or appreciating a permanently noble and wise policy. The outbreak of the Peloponnesian war (431 B.C.) brought the rivalry between Sparta and Athens to a head, and in the mighty struggle that ensued, victory declared on the side of the combatant least capable of maintaining the greatness of Greece. Sparta now attained the hegemony of Greece; but her insolent tyranny in the hour of her triumph excited the indignation of those whom she held in virtual subjugation, and the glorious retaliation of the Thebans under Epaminondas (q.v.) stripped her of all her splendid acquisitions, and reduced the Laconian state to its primitive boundaries. Later, the rise of the Macedonian power limited still more the Spartan territory, nor did it ever after attain its earlier dimensions. Finally, after a series of vicissitudes, Sparta passed into the hands of the Romans, became a portion of the Roman province of Achaia, and shared the fortunes of the great republic.

SPARTACUS, the leader in the great insurrection of Roman slaves in southern Italy which took place 73 B.C., and in all probability the first servile captain in point of genius of whom history preserves a record, was a native of Thrace, and originally followed the occupation of a shepherd, but afterward became a robber-chief. Having the mis-

fortune to be taken prisoner, he was placed in a training-school for gladiators kept by one Lentulus Batiatus, at Capua. A conspiracy to escape was formed among the gladiators (200 in all, and mostly Gauls and Thracians), the heads of which were Spartacus, and two Gauls, Crixus and Enomaus. The conspiracy was discovered; but 70, among whom were the leaders, forced their way through the streets of Capua with cleavers and other such rude weapons as they could seize, defeated a detachment of Roman soldiers sent to bring them back, and established themselves on Mt. Vesuvius, where they received considerable accessions to their number—chiefly runaway slaves. Three thousand Roman troops under C. Claudius Pulcher sought to blockade them here and starve them into surrender. Spartacus was now chosen as their leader, with Crixus and Enomaus for his lieutenants. Descending the hill at a place and in a way totally unexpected, he took his assailants in the rear, and inflicted on them a disgraceful defeat. His original design had been limited to securing his freedom, and making his way back to his own country, nor during the two years that the insurrection lasted did he ever forget this ultimate aim; but in order effectually to carry it out, he recognized the necessity of a far more serious and extensive warfare than had yet been waged, and proclaiming freedom to all slaves, he contrived to raise his trivial mutiny to the dignity of a servile war. Circumstances were favorable. A great portion of Italy, especially of central and southern Italy, had been turned into pasture-land (see *ROME*), and instead of villages of sturdy and independent farmers, who owned the land they tilled, gangs of discontented slaves watched the flocks and herds of great nobles, demoralized by a plethora of ill-gotten riches. It was to these slaves that Spartacus appealed, and his summons was not in vain. Thousands upon thousands rushed to his standard, and victory followed him wherever he went. The story of his triumphs reads like a romance. No knight of chivalry was ever more uniformly successful, for a time. After defeating Claudius Pulcher, he routed and slew Cossinius, legate of Publius Varinus; then he worsted Varinus himself in several engagements, capturing his lictors and the very horse on which he rode. All the southern part of the peninsula now fell into his hands: the country was devastated, the cities either pillaged or garrisoned. But Spartacus knew too well the enormous resources of Rome, and the extraordinary energy which she was capable of exhibiting in the hour of peril, to hope for final success, and he consequently sought to induce his victorious bands to march northward to the Alps, and disperse to their own homes, the Gauls to the west, and the Thracians to the east. But the slaves were too deeply intoxicated with their success to see the wisdom of his proposal, and Spartacus had to continue his career of mere fighting against his better judgment, and embarrassed by the jealousies that are so apt to spring up among undisciplined and servile hordes. What brilliant gallantry and skill he showed, is known to all readers of Roman history. After the defeat and death of his lieutenants who had separated from him (72 B.C.), he marched north through Picenum toward the Po, overthrew first one consular army under Cn. Cornelius Lentulus and then another under Gellius Poplicola, and at the head of 100,000 men, meditated a march on Rome. Since the days of Hannibal, there had never been such danger! Fortunately, servile indecision and unwisdom saved the city. Spartacus was forced by his followers to retreat south, and took up his winter-quarters at Thurii, where he held a great fair for the sale of the spoils of Roman cities. In 71 B.C., Crassus (q.v.) took the field against the terrible slave-leader, but for a while even he could do nothing. Near Mutina, the proconsul, C. Cassius Longinus, and the proprætor, Cn. Manlius, were defeated; in Picenum, Mummius, a legate of Crassus's, was utterly routed; at last, however, Crassus succeeded in forcing Spartacus into the narrow peninsula of Rhegium, whence he tried to get into Sicily, with the view of rekindling the servile war that had recently raged in that island, but failed in his attempt, through the treachery of those with whom he had opened negotiations. Crassus now built lines of circumvallation to hem him in, and force him to surrender; but one stormy winter-night, Spartacus broke out of the toils prepared for him, and resumed the offensive, although he had suffered heavily by loss and desertion, and his forces were still further diminished by the formation of an independent army of Gallic slaves, which had no sooner got a leader of its own, than it was annihilated. Near Petelia, he once more defeated his adversaries; but seeing clearly that with such wretched materials as he had he could not hold out much longer, he made a dash at Brundisium, hoping to seize the shipping in the harbors, and get safely across the Adriatic to his native shore, but was baffled by the presence of Lucullus (q.v.). Pompey, too, had returned from Spain. There was nothing left for Spartacus but to die as gallantly as he had lived. Drawing up his army in battle-array, and solemnly slaying his war-horse, he began his last fight in a spirit of heroic desperation, and after performing prodigies of valor, fell unrecognized among the heaps of his slain foes. After his death, the slave insurrection was at an end.

SPARTANBURG, a n.w. co. of South Carolina, bordering on North Carolina, crossed by several railroads; drained by Pacolet and Tiger rivers; 949 sq. m.; pop. '90, 55,385. Co. seat, Spartanburg.

SPARTANBURG, city and co. seat of Spartanburg co., S. C.; on the Charleston and West Carolina, the Glenn Springs, and the Southern railroads; 98 miles n. of Columbia. It is the seat of Wofford college (M. E., S.), and of Converse college for women (non-sect.), and has the Kennedy public library, Morgan monument, gas and electric lights, street railroads, national and state banks, about 12 churches, daily and weekly newspapers, gold and iron mines, limestone quarries, and cotton mills. Pop. '90, 5544.

SPASM (Gr. *spasma*) consists in an irregular and violent contraction of muscular parts—involuntary even when the voluntary muscles are concerned. There are two sorts of spasm. In one there is an unusually prolonged and strong muscular contraction, not rapidly alternating as usual with relaxation, the relaxation only taking place slowly and after some time. This is known as *tonic spasm* (Gr. *tônōs*, a bracing up) or *cramp* (q.v.) “When in a more moderate degree affecting the voluntary muscles generally, it constitutes catalepsy (q.v.), in which, from the muscles remaining contracted, the limbs will retain whatsoever attitude they are placed in until the spasm is over. But the extreme example is tetanus (q.v.), in which the spasms are so violent and so enduring that they may be said to squeeze the patient to death.”—Williams's *Principles of Medicine*, 2d ed. p. 72. In the other form of spasm, the contractions of the affected muscles take place repeatedly, forcibly, and in quick succession; the relaxations being, of course, equally sudden and frequent. This is named *clonic spasm* (Gr. *klônōs*, an agitation, and is popularly known as *convulsions*. Chorea (or *St. Vitus's dance*), epilepsy, and convulsive hysteria afford examples of this kind of spasm.

The treatment varies according to the cause of the excessive muscular irritability. Firm pressure on muscles affected with spasm will promote their relaxation, and by strong steady pressure on the masseter muscles, the lower jaw has been depressed, so as to open the mouth in cases of lock-jaw. The medicines which are employed to counteract irregular or inordinate muscular action are termed *antispasmodics*; but spasm may depend upon so many different causes, that the remedies which are found most successful in combating it must vary extremely in their nature. There are, however, a few medicines which appear to exercise a control over spasmodic action generally. These may be termed *pure or true antispasmodics*. They are asafetida, coryledon umbilicus (or common navel-wort), wood-soot, galbanum, musk, rue, sagapenum, sumbul (jatamansi or musk-root), and valerian. Among the narcotics often useful in these affections we may especially mention belladonna, cannabis indica (or Indian hemp), opium, and stramonium. Sulphuric ether in draught or inhaled, and inhaled chloroform, are often of service. In some cases remedies which directly depress the vital powers, such as the prolonged use of the warm bath, or even, in rare cases, the abstraction of blood, are the most effectual means of subduing spasm.

SPATHE (*spatha*), in botany, a sheathing bract which incloses one or more flowers, as in the *narcissus*. Very frequently the flowers within a spathe are arranged upon a *spadix*, which is a succulent spike, with numerous flowers, and of which a familiar example may be seen in *arum maculatum*. The spadix is a characteristic feature of the palms, and in them is compound or branching, and in general is not only provided with a common spathe, but with secondary spathes at its divisions. See *illus.*, GRAIN, ETC., vol. VI.

SPAULDING, LEVI, D.D., 1791-1873; b. New Hampshire; graduated at Dartmouth college 1815; at Andover theological seminary, 1818; sailed as a missionary of the American board for Ceylon 1819; reached Jaffna, 1820. He lived for a number of years in Manepy. In 1833 he, with Mrs. Spaulding, removed to Oodooville, and took charge of the Oodooville central school for girls. For about 40 years, with untiring patience, sympathy, and care, they watched over the little ones, sometimes to the number of 120 or 130; receiving them usually when about eight years of age, and seldom parting with them until they were married. Mr. Spaulding was fluent in the use of the language, and his originality and power of illustration gave him ready access to the native mind. He preached Christ by the roadside, in the field, in the school-room. His literary work was multitudinous; not only were school-books, hymn-books, tracts, gospels, continually passing through his hands for revision and proof-reading, but he wrote and translated some small but valuable books and some excellent hymns, besides preparing an English and Tamil dictionary. In addition to this he aided in the revision of a Tamil version of the Scriptures. He visited America once in the 53 years of his life among the heathen. The native converts throughout the district loved him as a father.

SPAVIN, a disease of horses, occurs under two different forms, both interfering with soundness. In young, weakly, overworked subjects, the hock-joint is sometimes distended with dark-colored thickened synovia or joint-oil. This is bog or blood spavin. Wet bandages, occasional friction, a laxative diet, and rest should for several weeks be diligently tried; and if such remedies prove unsuccessful, the swelling must be dressed with strong blistering ointment, or fired. The second variety of spavin is the more common and serious. Toward the inside of the hock, at the head of the shank-bone, or between some of the small bones of the hock, a bony enlargement may be seen and felt. This is bone spavin. At first there is tenderness, heat, swelling, and considerable lameness; but as the inflammation in the bone and its investing membrane abates, the lameness is less perceptible, although the animal continues to drag his leg and go stiffly. In recent and slight cases, cold water should be applied continuously; but in serious cases, when the limb is swollen and tender, hot fomentations are best. For several days they must be perseveringly employed. When the limb is again cool and free from pain, an iodide of mercury or fly-blister should be applied, and the animal treated to three months' rest in a small paddock, the end of a barn, or a roomy loose-box. In persistent cases, firing or setoning usually gives much relief.

SPEAKER, the name given to the presiding officer in either house of parliament. In the house of lords, the lord-chancellor, or lord keeper of the great seal, is *ex-officio* speaker, and one or more deputy-speakers are appointed by commission to take his place in his absence. Since 1851 it has been the practice to appoint but one deputy-speaker, who is the chairman of the lords' committee, and should he also be absent, the house can choose a speaker *pro tempore*. The speaker of the lords may speak or vote on any question, and has no more authority than any other member of the house.

In the house of commons, the speaker is a member elected to that office at the desire of the crown, and confirmed by the royal approbation given in the house of lords. A similar office seems to have existed as early as the reign of Henry III., when Peter de Montfort signed and sealed an answer of the parliament to Pope Alexander, *vice totius communitalis*; but the title speaker was first given to sir T. Hungerford in the reign of Edward III. The speaker of the house of commons presides over the deliberations of the house, and enforces the rules for preserving order: he puts the question and declares the determination of the house. As the representative of the house, he communicates its resolutions to others, and conveys its thanks or its censures. He is thus the mouth-piece of the house, whence his title seems to be derived. He issues warrants in execution of the orders of the house for the commitment of offenders, for the issue of writs, the attendance of witnesses, the bringing up prisoners in custody, etc. The mace is borne before him by the sergeant-at-arms when he enters or leaves the house; when he is in the chair it is left on the table, and it accompanies him on all state occasions. He cannot speak or vote on any question, but on an equality of voices he has a casting vote. Both by ancient custom and legislative declaration, he is entitled to take precedence of all commoners.

Down to the year 1853 no provision existed for supplying the place of the speaker of the house of commons when he was unavoidably absent; but in that year the house, with consent of the crown, resolved that in his absence the chairman of the committee of ways and means should take the chair, and as deputy-speaker he was in 1855 invested, both by resolution of the house and by act of parliament, with the same authority *pro tempore* as the speaker. The speaker of the U. S. house of representatives is a member of the house, chosen from among themselves for the office, and during the time of his holding it receives (since 1874) a salary of \$8000. He presides over the sessions of the house; makes the appointments of members of committees; signs all its bills, resolutions, and acts of authority; certifies to the mileage, etc., of members; and appoints three of the regents of the Smithsonian institution. He can be removed from his position by an act of the house. The position is one of great importance. See CONGRESS.

SPEAKING. See READING and SPEAKING.

SPEAKING-TRUMPET, an instrument for giving concentration rather than dispersion to the waves of sound originated by the articulation of the human voice, and thereby enabling the sound to be conveyed to a greater distance. It is of the utmost use on shipboard in enabling the officers to convey orders during windy weather from one part of the deck to another, or to the rigging. The invention is ascribed to sir Samuel Morland, in 1670, though Athanasius Kircher laid claim to it. Morland's trumpet was of the same form as that now in use, viz., a truncated cone, with an outward curve or lip at the opening.

The theory of the action of this instrument has never been thoroughly explained; but it is supposed that the sides of the tube throw the sound back and back in various reflections, until ultimately the waves quit the instrument in parallel lines. It does not seem to depend on vibration of the instrument.

SPEAR, a pointed weapon with a shaft of greater or less length for thrusting, throwing, or receiving an assault. See JAVELIN, LANCE, PIKE.

The *spear-foot* of a horse is his far foot behind.

SPEAR, SAMUEL P., 1815-75; b. Boston, Mass.; enlisted in the army, 1833; served in the Florida and Mexican wars under Gen. Scott; was wounded at Cerro Gordo. He was assigned to duty on the frontier, 1848-61, and engaged in the operations in Utah under Gen. A. S. Johnston. In the war of the secession he recruited and commanded the 11th Penn. cavalry, was wounded twice at Five Forks, promoted to brig.gen. and brevetted maj.gen. for gallant service. He died from disease contracted in the army.

SPEAR, SAMUEL THAYER, D.D., b. N. Y., 1812; graduated at the college of physicians and surgeons, New York, 1833; studied theology with Dr. Beman of Troy; was ordained and settled pastor of the Presbyterian church, Lansingburg, N. Y., 1835, and of the South Presbyterian church, Brooklyn, 1848; became one of the editors of the *Independent*, 1870. His publications are *The Family Power: Eighteen Sermons on the Rebellion*; *The Legal-Tender Acts considered in Relation to their Constitutionality and Political Economy*; *Religion and the State, or the Bible and the Public Schools*. He is an earnest advocate of the secularization of the government.

SPEARMINT. See MINT.

SPECIAL CASE is the name given in the law of England to a statement of facts submitted to a court for its opinion as to the proper application of the law, or proper legal

inference to be drawn from such facts. It is drawn up by mutual agreement of the parties, and may be agreed upon at any stage of the suit, or even before any step has been taken in it.

SPECIAL JURY is, in England, a jury consisting of a superior class of men, such as esquires or persons of higher degree, bankers, or merchants selected by the sheriff, and formed into a separate list. Either party to an action may demand a special jury, but he must pay the extra expense, provided the judge do not certify at the conclusion of the trial that it was a proper case to be tried by a special jury, in which case the costs are part of the costs in the cause. Each special jurymen gets a guinea for his attendance on the case. The advantage of a special jury is, that the jurors are less likely to be carried away with vulgar prejudices, and more intelligent, and able to understand difficult cases.

Special juries are not known in the U. S., as in ordinary matters it is presumed that all citizens are equally capable of deciding upon the facts. What are called struck juries, however, are generally recognized. Such juries are formed in a peculiar way. The sheriff makes a list of 48 men. From this list first one side and then the other strikes off a name until 24 names only are left, from which the jury of 12 is selected by lot. These juries are composed of men particularly adapted to try cases involving technical knowledge, as a jury of physicians to try a case involving much knowledge of physiology or anatomy.

SPECIAL LICENSE, in the marriage law of England, means a license obtained from the archbishop, which enables the priest to marry the parties without the publication of bans, and also at any time or place other than those necessary in ordinary cases. The statute of 25 Henry VIII. c. 21, entitled an act concerning Peter Pence and dispensations, continued to the archbishop of Canterbury the same right, as the pope previously had to grant special licenses to marry at any convenient time and place. By a regulation of archbishop Secker in 1759, the privilege is restricted to children of peers, and privy counsellors, judges, baronets, and knights. The same conditions apply to applicants as in other cases, except that the special license merely authorizes a different time and place for the marriage than in other cases. The stamp-duty is £5.

SPECIALTY DEBT, in English law, was a debt constituted by deed under seal, as a bond, which in the event of the debtor's death had a right of prior payment over simple contract (q.v.) debts. Such preference is, since 1870, abolished, except where a lien or other security is held for the debt.

SPECIE PAYMENTS, RESUMPTION OF. Shortly after the outbreak of the civil war, specie payments were suspended, not by legal enactment, but by the action of the banks throughout the country, the New York banks taking the initiative by suspending coin payment, 1861, Dec. 30. This was the natural result of the fact that a large proportion of the metallic currency had gone abroad to pay foreign indebtedness. The government was obliged to follow this example in regard to U. S. notes then outstanding and matured, and it consequently became necessary to meet the requirements of trade by increasing the volume of paper currency (see BANK-BANKING) and declaring such currency a legal tender for all debts public and private, except duties on imports and interest on the public debt. By 1864, Jan. 30, the amount of outstanding notes or greenbacks had increased to \$449,338,902, but in June of the same year an act was passed limiting the amount issued, or to be issued, to \$400,000,000, and such additional sum, not exceeding \$50,000,000, as might be temporarily required for the redemption of temporary loans. This act was rendered necessary by the alarming depreciation which had taken place in the value of greenbacks. A retirement of the balance in excess of the newly legalized amount was gradually made. In 1865, Sec. McCullough advocated a further contraction of the greenback currency with a view to as early a resumption of specie payments as the business interests of the country would permit. Congress, concurring in this view, directed, 1866, April 12, that ten millions of outstanding greenbacks might be retired and canceled within 6 months, and that thereafter, four millions or less might be retired per month. Under this act the outstanding amount was reduced to \$356,000,000 by the end of 1867. But the stringency of the money market began to cause alarm, no more retirements were made and, 1868, Feb. 4, congress suspended the authority to further reduce the paper-currency. The panic of 1873, which by many was attributed, in part at least, to the withdrawal of money from circulation, led to the reissue of some of the notes which had been retired. Secretaries Boutwell and Richardson both held the opinion that these notes could be reissued until the maximum limit of four hundred millions had been reached. But in 1874 congress reduced the limit to \$382,000,000, the amount then actually outstanding. In 1875, Jan. 14, the Resumption act was passed. This provided for the coinage of fractional silver currency to redeem notes of similar denominations, until all the fractional paper currency had been withdrawn from circulation; for an unlimited issue of national bank notes, with a concurrent retirement of legal tender notes to the extent of 80 per cent. of the issue of national bank notes until the outstanding amount had been reduced to \$300,000,000; and for the redemption in gold coin of such outstanding amount on and after 1879, Jan. 1, on the presentation of the notes in sums of \$50 and upward.

at the sub-treasury in New York. To carry this act into effect, the sec. of the treasury was authorized to use surplus revenues of the government, and also to issue at par in coin either of the descriptions of bonds authorized by the refunding act of 1870. Between the date of this act and the day fixed for resumption there was no important legislation affecting the money market, except the passage of the silver act, 1878, restoring to the currency of the country the old silver dollar of 412½ grains, and enforcing its coinage to the extent of at least two millions a month. Many strenuous efforts indeed were made to repeal the resumption act but without effect. As the appointed day approached Sec. Sherman bent all his energies to provide the coin reserve presumed to be necessary to meet the emergency, and his preparations were so complete that on 1879, Jan. 1, the treasury held about \$135,000,000 in coin available for resumption purposes, or 40 per cent. of the amount of notes to be redeemed. But the actual conversion of paper-money into coin was very small. The banks of the country held about one-third of the total amount of treasury notes, but their confidence in the power of the government to maintain resumption was so great that none were presented by them for redemption. The people in general preferred the issues of the banks and of the government to coin, on account of their superior convenience and portability, so that the resumption of specie payments neither decreased the volume of paper currency nor depleted the treasury of its coin. It merely placed the gold and the paper dollar on the same basis, prevented unnecessary fluctuations in the value of legal tender currency, and so established renewed confidence in business circles, and marked the end of the commercial depression consequent upon the revulsion and panic of 1873.

SPECIE. Gold, silver, copper, or nickel made into coin (q.v.) and used as a circulating medium of commerce; hard money. See **BANKING**.

SPECIES, in natural history, a term employed to designate groups inferior to genera (see **GENUS**), but superior to varieties (see **VARIETY**). In mineralogy, the term is of very arbitrary application, serving only, like class, order, genus, etc., the purpose of classification, although it thus indicates common characters or points of real agreement among minerals. In organic nature, it has usually been regarded as possessing a higher and more definite signification. But no term is more difficult to define. Many definitions have been proposed, but none wholly satisfactory; every attempt at definition involving more or less the adoption of some disputed theory. If, for example, a species is regarded as including all the beings which have descended from parents created with the essential characters now belonging to the species, not only is the original creation in that particular form taken for granted, but likewise the impossibility of changes in nature, which some of the most eminent naturalists regard as actually taking place, and the belief of which implies no doubt of the act of creation itself, but only a certain opinion as to some of the laws by which organic nature is governed. To regard species as mere indeterminate and fluctuating groups, capable of indefinite modification in the lapse of ages, is equally to adopt a theory. If a species is defined as containing all the individuals which are capable of intermingling without consequent sterility of progeny, other difficult questions must be decided before the definition can be adopted as to any classes of creatures, while to many kinds it seems incapable of application, and much that is merely theoretical is involved in it.

Naturalists have very generally regarded species as unchanging throughout the longest succession of generations, except within narrow and marked limits, and have substantially adopted the definition of Buffon: "A *species* is a constant succession of individuals similar to and capable of reproducing each other." Thus De Candolle, the eminent botanist, says: "We unite under the designation of a *species* all those individuals that mutually bear to each other so close a resemblance as to allow of our supposing that they may have proceeded originally from a single being or a single pair." And Cuvier, the great zoologist, describes a species as "a succession of individuals which reproduces and perpetuates itself." Here it may be remarked, that even if the permanence of species implied in these definitions were fully ascertained, and their original creation in their present form admitted as unquestionable, it would by no means follow that we must suppose every species to have proceeded from a single individual or a single pair. Nor, accepting the Biblical statement concerning the human race, that all mankind are the offspring of a single pair, are we entitled to infer that such has been the case also as to all animals and plants capable of freely intermingling, and which, therefore, are commonly regarded as forming one species.

But the separate creation and immutability of species are disputed, some naturalists maintaining that species undergo modification, and that existing forms of life have descended by true generation from pre-existing forms. Lamarck was the first to proclaim this doctrine, at least so as to attract much attention, about the beginning of the 19th century. He held that all species, even including man, are descended from species of inferior organization; while to account for the existence of very simple forms at the present day, he had recourse to the supposition of their spontaneous generation. He was followed, with greater caution, by Geoffroy Saint-Hilaire, who regarded what we call species as various degenerations of the same type, but did not believe that the existing species are now undergoing modification. Similar views have since been stated

by many authors. But the works which have most strongly directed attention to them, and in which they have been most fully advocated, are the *Vestiges of the Natural History of Creation*, by an anonymous author, originally published in 1844, and which has since passed through many editions; and Darwin's work *On the Origin of Species by means of Natural Selection*, originally published in 1859. Of the other supporters of these views, the most eminent is prof. Huxley, who, without fully adopting the views either of the author of the *Vestiges* or of Darwin, advocates "the hypothesis which supposes the species living at any time to be the result of the gradual modification of pre-existing species," and maintains that to suppose each species of plant and animal to have been formed and placed on the surface of the globe at long intervals by a distinct act of creative power, is an assumption "as unsupported by tradition or revelation as it is opposed to the general analogy of nature."

It is impossible for us to do more than very briefly exhibit the principal arguments which have been urged on this question. Lamarck rested much on the well-known effect of use or exercise in strengthening and enlarging an organ, and of disuse in atrophying it. "He conceived that, an animal being brought into new circumstances, and called upon to accommodate itself to these, the exertions which it consequently made to that effect caused the rise of new parts: on the contrary, when new circumstances left certain existing parts unused, these parts gradually ceased to exist. Something analogous was, he thought, produced in vegetables, by changes in their nutrition, in their absorption and transpiration, and in the quantity of caloric, light, air, and moisture which they received. This principle, with time, he deemed sufficient for the advance from the monad to the mammal." The author of the *Vestiges* from whom this account of Lamarck's views is taken, regards him as in error "in giving this adaptive principle too much to do;" and says: "In the present day, we have superior light from geology and physiology, and hence comes the suggestion of a process analogous to ordinary gestation for advancing organic life through its grades, in the course of a long but definite space of time, with only a recourse to external conditions as a means of producing the exterior characters." The author of the *Vestiges* designates the principle for which he contends that of *Progressive Development*, and states it as follows: "The proposition determined on, after much consideration, is, that the several series of animated beings, from the simplest and oldest up to the highest and most recent, are, under the providence of God, the results, *first*, of an impulse which has been imparted to the forms of life, advancing them in definite times, by generation, through grades of organization terminating in the highest dicotyledons and vertebrata, these grades being few in number, and generally marked by intervals of organic character which we find to be a practical difficulty in ascertaining affinities; *second*, of another impulse connected with the vital forces, tending, in the course of generations, to modify organic structures in accordance with external circumstances, as food, the nature of the habitat, and the meteoric agencies, these being the 'adaptations' of the natural theologian." He further regards the *nucleated vesicle* as "the fundamental form of all organization, the meeting point between the inorganic and the organic," and as "the starting point of the fetal progress of every higher individual in creation, both animal and vegetable." Founding on instances of the production of the *proximate principles* of which organic substances are composed in the laboratory of the chemist, he goes on to say that "an operation which would produce in these the nucleated vesicle is all that is wanting effectually to bridge over the space between the inorganic and the organic;" and that "it does not seem, after all, a very immoderate hypothesis, that a *chemico-electric operation, by which germinal vesicles were produced*, was the first phenomenon in organic creation, and that the second was an *advance of these through a succession of higher grades, and a variety of modifications* in accordance with laws of the same absolute nature as those by which the Almighty rules the physical department of nature." He regards the idea of species or specific distinction, therefore, "as *merely applicable to certain appearances presented, perhaps transiently, to our notice*." He adduces instances of great changes of form and character known to take place in the lower departments of nature, both animal and vegetable, as giving probability to the supposition, that in a long succession of generations, great changes may take place also in the higher.

The whole theory of the author of the *Vestiges* as to organic nature has been exposed to objection in consequence of its connection with views of the general system of the universe altogether foreign to the present subject; and because of an evident inclination to the belief in a transition from inorganic to organic existence by chemico-electric operation. The argument is also weakened by the too ready acceptance of unsubstantiated facts, as of the transmutation of one kind of grain into another; and by resting too much on what may be reckoned the mere mistakes of naturalists, as to the forms of the lower kinds of plants and animals, of which genera and even tribes have been constituted, that have afterward been found to be mere modifications or larval stages of creatures very different in their most apparent characters. Much hostility has been also excited by the extension of the theory of development to the human species, connecting man with pre-existing and inferior forms of animal existence. All this has been avoided by Darwin, by whom, however, the chief arguments of the *Vestiges* are used with great scientific caution.

Darwin's views are distinguished by the introduction of what he designates the prin-

ciple of *natural selection*. He maintains the variability of species, and adduces much evidence to show that variation is continually taking place in consequence of the external conditions to which plants and animals are subjected. He rests much on the difficulty of distinguishing between varieties and species, and on the changes which are known to result from cultivation and domestication. He dwells on the *selection* which man makes in order to produce new breeds or varieties, and supposes a similar "selection" to take place in nature, in the *struggle for life*, which all plants and animals must undergo. This *struggle for life* is, in fact, the foundation of his theory. He shows that every kind of plant or animal must maintain it, and in order to its continued existence, must be successful in maintaining it not only against those other creatures which seem to make it their food, but still more in a competition with those which seek the same nutriment with itself. In this struggle the stronger, or those which possess anything peculiarly favorable in their organization, must overcome the weaker, and these must therefore cease to exist. Thus a slight variation, such as often takes place, may be perpetuated; and the possessors of any advantage in the means of procuring food, or in the powers of offense or defense, may entirely displace their less favored congeners. The modifications thus taking place Darwin regards as accounting for the changes in organized beings from one geologic period to another, and for the great differences in the plants and animals of different parts of the world. In support of his views, he argues from the tendency to variation seen in cultivated plants and domestic animals, and the perpetuation of the forms so produced in breeds and races; and from the fact that the variations in cultivated and domestic species are in some cases greater than those which are regarded as affording grounds of specific, and sometimes even of generic or greater distinctions in a state of nature. "Can it be thought improbable," he says, "seeing that variations useful to man have undoubtedly occurred, that other variations useful in some way to each being in the great and complex battle of life, should sometimes occur in the course of thousands of generations? If such do occur, can we doubt—remembering that many more individuals are born than can possibly survive—that individuals having any advantage, however slight, over others, would have the best chance of surviving and of procreating their kind? On the other hand, we may feel sure that any variation in the least degree injurious would be rigidly destroyed. This preservation of favorable variations and the rejection of unfavorable variations, I call *natural selection*. Variations neither useful nor injurious would not be affected by natural selection, and would be left a fluctuating element, as perhaps we see in the species called polymorphic." He further supports these views by pointing out the favorable opportunity for the operation of natural selection afforded in a country undergoing great physical changes, as of climate; and particularly in an island, or a country surrounded by barriers sufficient to prevent the ready immigration of species. "In such cases," he says, "every slight modification, which in the course of ages chanced to arise, and which in any way favored the individuals of any of the species by better adapting them to their altered conditions, would tend to be preserved; and natural selection would thus have free scope for the work of improvement."

Mr. Darwin supposes new variations to be continually taking place, but the greater number of these speedily to become extinct; while others, becoming perpetuated, and perhaps causing the extinction of the original forms, again give rise to other forms, until some of them have so widely diverged that all traces of their common origin are lost. He does not, however, commit himself to the opinion that all forms of organic life, or even all plants, or all animals, have a common origin. He completely rejects Lamarck's notion that new and simple forms are continually being produced by spontaneous generation. "I need hardly say," he remarks, "that science in her present state does not countenance the belief that living creatures are now ever produced from inorganic matter," and he accounts for the existence of low forms of life by saying that "natural selection includes no necessary and universal law of advancement or development; it only takes advantage of such variations as arise and are beneficial to each creature under its complex relations of life." So that even the lowest forms might "be left by natural selection unimproved, or but little improved," as geology tells us of infusoria and rhizopods which have remained for an enormous period in nearly their present state.

That species differ not only in single characters, but in many, Mr. Darwin accounts for by reference to unknown laws of the correlation of organs—laws, however, which, although unknown, we know to exist, so that a modification of one organ is attended with modification of other organs, as is exemplified in our domestic breeds.

In further support of the theory of natural selection, the fact is insisted upon, "that it is the common, the widely diffused, and widely ranging species, belonging to the larger genera within each class, which vary most." That the several subordinate groups in any class of creatures "cannot be ranked in a single file, but seem rather to be clustered round points, and these round other points, and so on in almost endless cycles," Mr. Darwin thinks incapable of explanation, except on the supposition of community of origin and natural selection. He points also to the analogous manner in which species of the same genus vary, as corroborative of his views. He accounts for the absence or rarity of transitional varieties by supposing the predominant forms to have taken possession of their districts, while these were in process of being stocked; and that these districts, differing much in their natural characters, the forms originating in the com-

paratively unextensive intermediate tracts, have not been able to contend against them, and have become extinct. He points out the possibility that areas now continuous may not have been so during a long period, and that species may have been formed while they were broken up into islands. But this remains a chief difficulty of his theory.

He ascribes to natural selection the results which Lamarck ascribed to use and disuse in the development and atrophy of organs; and thinks it not impossible that the flying squirrels may thus have had a common origin with the true squirrels, and the *galeopithecus* with the lemurs, although he admits that we have no graduated links of structure connecting them together. "Nor can I see any insuperable difficulty," he says, "in further believing that the membrane-connected fingers and forearm of the *galeopithecus* might be greatly lengthened by natural selection; and this, as far as the organs of flight are concerned, would convert it into a bat." Like Lamarck and the author of the *Vestiges*, Mr. Darwin rests not a little on the unity of type throughout whole classes of creatures, and the homologies of parts very different from each other, as in the four-limbed structure of the vertebrata generally, and even the articulations of the limbs. He endeavors to trace the eye from its simplest to its most perfect form, and shows how gradual are the transitions found on comparison of existing creatures, from the one to the other. He goes even further, and says: "Several facts make me suspect that nerves sensitive to touch may be rendered sensitive to light, and likewise to those coarser vibrations of the air which produce sound."

He dwells at great length on the subject of hybridism, and the general sterility of hybrids, endeavoring to show that it presents no insuperable objection to the theory of a gradual modification of species, their sterility being incidental on other differences, and sterility occurring, as he labors to prove, when varieties are crossed, as well as in the hybrids of distinct species. The difficulties presented by geology he obviates very much by insisting on the imperfection of the geological record. He does not adopt the view of the author of the *Vestiges*, that the geological record exhibits to us a succession of animals corresponding in their progressive development with the fetal development of the mammalian embryo. But he founds an argument on the many connecting links in the general system of nature which fossils supply when compared with existing species. And he endeavors to show that his theory is perfectly consistent with the known facts of the geographical distribution of species, and in particular with the remarkable facts of the peculiarity of the fauna and flora of some of the lonely oceanic islands, and of the frequent occurrence of the same species both in cold regions comparatively near the pole, and on mountains far remote from each other in lower latitudes; referring the latter class of facts to former geologic periods, when the continental areas were not the same as now, or when the prevailing climatic conditions were very different. And he finds support for his views in the correspondence, without identity, of the floras and faunas of the northern parts of America and of the Old World.

It is but a very imperfect sketch which we have thus been able to give of Darwin's theory, and of the arguments by which it is supported. Whatever may be thought of the truth of the theory, it must be admitted to be admirably framed and guarded, and to be maintained not only with great ingenuity of argument, but by the aid of a vast store of scientific information, most skillfully used. Its opponents condemn it as resting on unwarrantable assumptions, and demand some proof, for example, of the transition of organs from a simple or rudimentary to a complex and more perfect state. They also refuse to acknowledge such imperfection of the geological record as Darwin's argument demands, and they insist much on the completeness of the changes which that record discloses, and the absence of transitional forms both among fossils and existing species. Much of what Darwin and other advocates of the same general views contend for, they admit; a certain power of development in organic nature, a "struggle for life," and "natural selection;" but they regard the limits of development and variation as comparatively narrow. Nor would the state of the question, as they believe, be materially affected, if many of what have hitherto generally been regarded as species, should be proved to be mere varieties. Any number of such errors of naturalists might be exposed and corrected, without modification of our views of the laws of nature; and errors of this kind are precisely such as might be expected, when the forms of organic life began to be discovered and described, and ere yet there was time for their mature study in all parts of the world, and under all various circumstances.

The doctrine of Darwin, or the *Evolution Theory* as it is usually named, continues to be a fruitful source of controversy. It has found many adherents in all countries, and its leading principle—"the survival of the fittest"—has been applied in other fields of inquiry besides natural history. It ought to be mentioned that the eminent naturalist, A. R. Wallace, unaware of the speculations Mr. Darwin was engaged in, had elaborated independently a very similar scheme; and the prior publication of Darwin's labors was chiefly accidental. Darwinism has made the most remarkable progress during recent years. Scarcely a living naturalist now entirely rejects it, and the vast majority indeed are earnestly occupied in its elucidation and application. It should be remembered, however, that this is not the only possible theory of Evolution. See articles on DARWIN; DARWINISM; ZOOLOGY; MAMMALIA; etc.; as also Darwin's *Origin of Species*, *Descent of Man*, and other works; Lyell's *Principles of Geology*; Huxley's *American Addresses and Science and Culture*; Haeckel's *Natural History of Creation*; Meurier's *Le Darwinisme*, SPENCER, HERBERT.

SPECIFIC DISEASES. See **VENEREAL DISEASES.**

SPECIFIC GRAVITY of any body is the proportion which the weight of a certain bulk of that body bears to the same bulk of another body, which is taken as a standard. The standard for substances solid and liquid is distilled water at the temperature of 62° Fahr., barometer 30 inches; and the weight of a cubic inch of this standard is given in the Parliamentary Reports for 1825 as 252.456 troy grains, hence a cubic foot of it weighs 997.129 avoirdupois ounces, or 62.32 avoirdupois pounds. It is convenient to remember that a cubic foot of water weighs about 1000 ounces avoirdupois, as the error resulting from employing this estimate does not amount to much more than $\frac{1}{350}$ th of the whole. For æriform bodies, the standard is atmospheric air, a cubic inch of which, at a temperature of 32° Fahr., weighs .32698, and at 60° Fahr., .30935 grains troy. The specific gravity of solid bodies is best measured by the hydrostatic balance—a figure of which is given under Archimedes, Principle of (q.v.)—which gives the weight of a volume of water equal in bulk to the solid, by which it is only necessary to divide the weight of the solid in air to obtain the specific gravity; that of liquids may be obtained by the areometer (q.v.), or by comparing the weight lost by a solid body in the liquid and in water, and dividing the former by the latter—or by means of the *specific-gravity bottle*, which holds exactly 1000 grains of distilled water in its standard condition. The bottle is emptied of water, filled with the liquid, and then weighed; the result gives the weight of a volume of the fluid equal in bulk to 1000 grains of the standard, and hence this weight divided by 1000 gives the specific gravity. The specific gravity of an æriform fluid is determined by weighing a glass globe filled first with the fluid and then with atmospheric air. Annexed is a table of the specific gravity of a few of the more common substances:

SOLIDS (METALS).			
	Sp. Gr.		Sp. Gr.
Iridium (hammered)	23.	Iron.....	7.78
Platinum.....	20.15	Tin.....	7.29
Gold.....	19.25	Zinc.....	7.19
Mercury.....	14.	Antimony....	6.70
Lead.....	11.35	Arsenic.....	5.76
Silver.....	10.74	Aluminium....	2.67
Bismuth.....	9.82	Calcium.....	1.58
Cobalt.....	7.81	Sodium.....	.97
Copper.....	8.78	Potassium.....	.86
Manganese.....	8.01		

OTHER SOLIDS.			
	Sp. Gr.		Sp. Gr.
Leadstone.....	4.93	Honey.....	1.45
Ruby.....	4.28	Lignum-vitæ.....	1.32
Topaz.....	4.03	Coal.....	1.16
Diamond.....	3.52	Amber.....	1.08
Limestone.....	2.70	Spanish mahogany.....	1.06
Chalk.....	2.45	English oak.....	.97
Glass, Flint.....	2.90	Butter.....	.94
Granite.....	2.78	Ice.....	.93
Flint.....	2.58	Human body alive.....	.89
Clay.....	2.16	Ash.....	.84
Ivory.....	1.92	Elm.....	.67
Bone.....	1.66	Poplar.....	.33
Sand.....	1.50	Cork.....	.24

LIQUIDS.			
	Sp. Gr.		Sp. Gr.
Sulphuric acid.....	1.84	Champagne wine.....	1.
Nitric acid.....	1.5	Burgundy wine.....	.99
Aqua regia.....	1.23	Whisky, average.....	.92
Blood.....	1.04	Oil of turpentine.....	.87
Oil of cinnamon.....	1.04	Brandy.....	.84
Oil of cloves.....	1.03	Alcohol, pure.....	.80
Milk.....	1.03	Ether, sulphuric.....	.72
Tar.....	1.01		

GASES.			
	Sp. Gr.		Sp. Gr.
Hydriodic acid.....	4.34	Oxygen.....	1.11
Chlorine.....	2.44	Olefiant gas.....	.98
Sulphurous acid.....	2.22	Nitrogen.....	.97
Cyanogen.....	1.80	Prussic acid.....	.94
Carbonic acid.....	1.52	Ammonia.....	.59
Muriatic acid.....	1.25	Hydrogen.....	.07

SPECIFIC LEGACY. See **LEGACY.**

SPECIFIC PERFORMANCE, in English law, is the compulsory execution or carrying out of a contract in its details, the court of chancery generally having alone jurisdiction to enforce specific performance. In Scotland, the corresponding phrase is *implement*. As a general rule the courts do not attempt to enforce specific performance, but as a substitute give the party injured by the breach of contract satisfaction in the shape of damages.

SPECTACLES, for the purpose of aiding the sight when impaired by age or otherwise (see **SIGHT**, **DEFECTS OF**), were invented during the 13th century. The merit is attributed

by some to Alexander di Spina, a Florentine monk, and by others to Roger Bacon. At first they were exceedingly clumsy, both in the lenses themselves and also in their frames; and but little improvement took place in them until the beginning of this century, when light metal frames were introduced, instead of the cumbrous horn or tortoise-shell mountings, which are still occasionally seen, and have obtained the name of goggles. So skillful are the workmen of Wolverhampton, where they are chiefly made, in the manufacture of steel frames, that some of exquisite workmanship are now turned out, which, with their lenses complete, are under a quarter of an ounce in weight. They have consequently displaced gold, silver, and all other materials, when comfort and effectiveness are preferred to useless show combined with inconvenience. The lenses themselves are nearly always made of the best optical glass, and by the best makers are ground with extreme care. Many profess to be made of "pebbles," or rock-crystal; but lenses really made of that material are exceedingly rare, and have no real advantage over good glass.

SPECTER BAT, *Phyllostoma*, a genus of bats having two membranous crests on the nose, the one leaf-like, the other in the form of a horseshoe. This gives to their face that peculiar appearance from which they derive their popular as well as their scientific name. The species are numerous, and all natives of the West Indies and South America.

SPECTROPHONE and **PHOTOPHONE** or **RADIOPHONE**. The action of these instruments depends upon the phenomena of radiant energy which within a few years have been observed by different physicists, but whose practical results, if the time has arrived when the term may be used, have been principally accomplished by Prof. Alexander Graham Bell, the inventor of the speaking telephone in common use, in conjunction with Mr. Sumner Tainter. The invention of the photophone arose from the employment by Willoughby Smith of selenium as a resistance medium in testing submarine cables. It was found that the resistance of selenium to the galvanic current varied considerably, and the discovery was made that this was caused by the action of light, which lessened the resistance. When selenium is exposed to the action of the solar spectrum, the maximum effect is produced, according to Sale, just outside of the red end of the spectrum, in a point nearly coincident with the maximum of the heat rays (see *Radiation* in article **HEAT**), but according to Adams it is produced in the greenish-yellow or most luminous part of the spectrum, and he moreover found that selenium was sensitive to the cold light of the moon. E. W. Siemens discovered that heat and light produced opposite effects upon some extremely sensitive varieties of selenium. In some of his experiments the resistance on exposure to light was only one-fifteenth of what it was in the dark. It occurred to Prof. Bell to substitute the telephone for the galvanometer hitherto used in these experiments on account of its great sensitiveness to electrical influences; but in doing so it was necessary to vary the action of light so that the intermissions from light to darkness should be sudden, in order to produce a succession of changes in the conductivity of the selenium corresponding in frequency to the musical vibrations within the limits of hearing; and upon further consideration it appeared to him that all the audible effects obtained from varieties of electricity could also be produced by variations of light acting on selenium. In an article in *Science* of Sept. 11, 1880, he says: "I saw that the effect could be produced at the extreme distance at which selenium would respond to the action of a luminous body, but that this distance could be indefinitely increased by the use of a parallel beam of light, so that we could telephone from one place to another without the necessity of a conducting wire between the transmitter and receiver. It was evidently necessary, in order to reduce this idea to practice, to devise an apparatus to be operated on by the voice of the speaker, by which variations could be produced in a parallel beam of light, corresponding to the variations in the air produced by the voice." But a difficulty was found in the fact that the resistance of selenium was too great to respond sufficiently to the action of light; this, however, was overcome by reducing this resistance—from some half million *ohms* to 300 in the dark, and to 155 in the light. The fundamental features of the selenium photophone are best given in Prof. Bell's own words: "We have devised about fifty forms of apparatus for varying a beam of light in the manner required. The best and simplest form consists of a plain mirror of flexible material—such as silvered mica or microscopic glass. Against the back of this mirror the speaker's voice is directed. The light reflected from this mirror is thus thrown into vibration corresponding to those of the diaphragm itself. In arranging the apparatus for the purpose of reproducing sound at a distance any powerful source of light may be used, but we have experimented chiefly with sunlight. For this purpose a large beam is concentrated by means of a lens upon the diaphragm mirror, and after reflection is again rendered parallel by means of another lens. The beam is received at a distant station upon a parabolic reflector, in the focus of which is placed a sensitive selenium cell, connected in a local circuit with a battery and telephone." The loudest effects obtained from light were produced by rapidly interrupting the beam by a perforated rotating disk, revolving over the face of another perforated disk, with holes corresponding. Audible musical tones were produced from the light of a candle.

The experiments connected with the construction of this apparatus led to others with other substances than selenium, and also without the use of telephone or battery. A thin sheet of hard rubber was held close to the ear while a beam of intermittent light was thrown upon it by a lens, the result being the production of a musical note, and this

effect was intensified by arranging the hard rubber as a diaphragm and listening through a hearing-tube. The remarkable though natural conclusion was reached "*that sounds can be produced by the action of a variable light from substances of all kinds when in the form of thin diaphragms.*" Subsequently Prof. Bell arrived at the conclusion that *sonorousness under the influence of intermittent light is a property of all matter.* Various experiments were made with different fibrous and porous materials, such as cotton-wool, worsted, silks, sponge, lamp-black, etc. These articles were inclosed in a conical cavity, contained in a piece of brass, and closed by a flat plate of glass through which an intermittent beam of light was thrown upon them. A hearing-tube communicated with the cavity. Mr. Tainter found that the darkest shades produced the best effects. Black worsted especially gave an extremely loud sound. Cotton-wool darkened with lamp-black gave so loud a sound as to suggest the use of lamp-black alone. Of this substance a teaspoonful, placed in a test-tube and exposed to an intermittent beam of sunlight produced the loudest sound of all, and a piece of smoked glass, with the smoked surface receiving the intermittent beam, gave a fine effect. Upon smoking the interior of the conical cavity of the receiver above-mentioned, and then exposing it to the intermittent beam, "the effect was perfectly startling. The sound was so loud as to be actually painful to the ear placed closely against the end of the hearing-tube." The various experiments above alluded to will probably be of great importance in telephony as indicating that lamp-black may be substituted for selenium in an electrical receiver. M. Mercadier passed an intermittent beam from an electric lamp through a prism and found a difference in the audible effects in different parts of the spectrum. These experiments were repeated by Prof. Bell, with somewhat different results. Under conditions not necessary to describe here, "sounds were obtained in every part of the visible spectrum excepting the extreme half of the violet, as well as in the ultra-red. A continuous increase in the loudness of the sound was observed upon moving the receiver gradually from the violet into the ultra-red. The point of maximum sound lay very far out in the ultra-red, corresponding exactly with the proportion of heat in different parts of the spectrum, and showing that these effects are produced by the heat which accompanies light. Beyond this point the sound began to decrease, and then stopped so suddenly that a very slight motion of the receiver made all the difference between almost maximum sound and complete silence." Removing the smoked wire gauze from the receiver and substituting red worsted different results were obtained, the maximum effect being produced in the green at that part where the red worsted appeared to be black. On either side of this point the sound gradually died away. On substituting green silk for the red worsted the maximum effects were found in the red. A test tube containing the vapor of sulphuric ether was then substituted for the receiver, but no effects were observed till a certain point far out in the ultra-red was reached, when a musical tone was suddenly produced, which disappeared as suddenly farther on. With the vapor of iodine the maximum effect was in the green. These, and experiments with other substances, led to the conclusion that "the nature of the rays that produce sonorous effects in different substances depends upon the nature of the substances that are exposed to the beam, and that the sounds are in every case due to those rays of the spectrum that are absorbed by the body." These phenomena led Prof. Bell to the construction of a new instrument for use in spectrum analysis. "The eye-piece of a spectroscope is removed and sensitive substances are placed in the focal point of the instrument behind an opaque diaphragm containing a slit. These substances are put in communication with the ear by means of a hearing-tube, and thus the instrument is converted into a veritable 'spectrophone.' Suppose we smoke the interior of our spectrophonic receiver and fill the cavity with peroxide of nitrogen gas. We have then a combination that gives us good sounds in all parts of the spectrum, visible and invisible, except the ultra-violet. Now pass a rapidly interrupted beam of light through some substance whose absorption spectrum is to be investigated, and bands of sound and silence are observed upon exploring the spectrum, the silent positions corresponding to the absorption bands. Of course the ear cannot for one moment compete with the eye in the examination of the visible part of the spectrum; but in the invisible part beyond the red, where the eye is useless, the ear is invaluable. In working in this region of the spectrum, lamp-black alone may be used in the spectrophonic receiver. Indeed, the sounds produced by this substance in the ultra-red are so well marked as to constitute our instrument a most reliable and convenient substitute for the thermo-pile." See *Science* for May 28, 1881. Prof. Bell recognizes the fact that the spectrophone is only an adjunct to the spectroscope, but believes that it will have a wide and independent field of usefulness in the investigation of absorption spectra in the ultra-red. See **RADIOPHONY**.

SPECTROSCOPE, the instrument by the aid of which spectral phenomena (see **SPECTRUM**) may be most conveniently studied. It consists essentially of, first, a narrow slit, from which parallel rays of light proceed; secondly, a prism or train of prisms, to separate the differently refrangible rays; and thirdly, a telescope, to view a magnified image of the spectrum produced. See **SUN**.

SPECTRUM (Gr.) is a term applied in optics to the colored image of the sun or other luminous body, produced by refraction through a prism (q.v.), by diffraction (q.v.) through a fine grating, etc. In what follows we shall confine ourselves to the spectrum produced by a prism, as that which is commonly used. Besides, so far as we have at

present occasion to examine it, it presents very nearly the same appearance as spectra produced by other processes.

The solar spectrum was first carefully examined by Newton, who deduced from his observations the composite nature of white light, and the different refrangibilities of its various colored constituents. A ray of sunlight enters a darkened room through a small hole, in a shutter. It proceeds in a straight line to the opposite wall, and forms as a circular white spot, an image of the sun. If the edge of a glass prism be interposed in the path of this ray, the white spot disappears, and the spectrum is produced. In this form of experiment, its shape is that of a rectangle with semicircular ends.

The breadth of the spectrum is equal to the diameter of the spot; and it is brilliantly colored, the one end being red, and the other end violet. Between these we have gradations of color, and the whole appeared to Newton to be divisible into seven differently colored spaces, which he called red, orange, yellow, green, blue, indigo, violet. This was in accordance with the speculations of old days, when analogies were constantly looked for, and seems to have been suggested to Newton by the common musical scale. It is impossible, however, to settle precisely the exact boundary between any two of these fancied species of color; and, besides, such a description of the spectrum (though complete enough for mere popular language) is totally inadequate to express our present knowledge of the subject. In order to study the spectrum a little more closely, suppose we have pieces of colored glass which allow only one definite color to pass. With a red glass placed at the hole in the shutter, the prism being removed, the effect would be to render the spot red, without changing its position. Introduce the prism, and the effect is to change the position of the spot without altering its size or color.

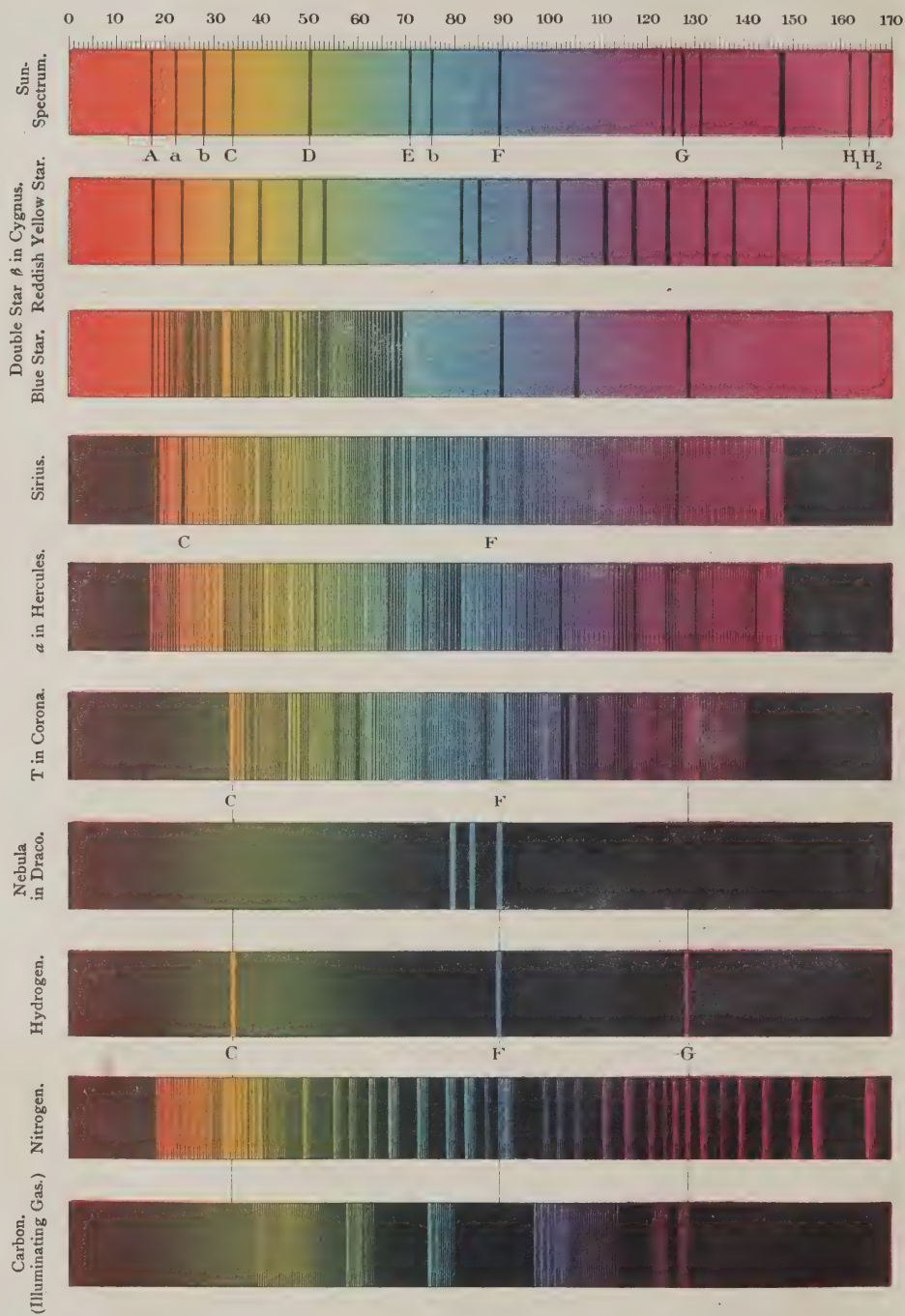
Similarly, with a violet glass we have a violet spot, and so on; the change of position, due to refraction, being least for red and greatest for violet. It thus appears that the spectrum formed in this way, is made up of a series of circular spots, of the various colors of which white light consists all of the same size, and having their centers ranged along a line, so that each overlaps those next it. The only parts of the spectrum which are *pure*, i.e., where no two or more colors are mixed, are the ends; so that, by this process, it is impossible to separate definitely the rays of different refrangibility, so as to see, for instance, *whether any are wanting*. How, then, are we to ascertain whether sunlight contains rays of every refrangibility from red to violet? The obvious method is to make the spot not circular, but long and very narrow, a process mentioned by Newton himself. To make this spot thus narrow, a method commonly employed, is to set the prism about half-way between the shutter and the screen and to place before it a lens, such that, if the prism were removed, there would be an image of the hole in the shutter nearly equal to it in size. The hole must, therefore, be a narrow slit, parallel to the edge of the prism. When this arrangement is adjusted we have a pure spectrum, and we find it to be (at first sight) *continuous*. Thus, it appears that sunlight contains rays of every refrangibility, from the highest to the lowest; and that Newton's sevenfold division of it, though sometimes convenient for popular reference, has no scientific basis. Besides, what we can see is not the whole spectrum but a mere fraction of it; for beyond the red end, there are invisible rays recognized at once by their heating powers; and beyond the violet, there are invisible rays more powerful than the visible in producing chemical changes, as on a photographic plate, and which can be changed into visible rays by fluorescent substances. See PHOSPHORESCENCE. The breadth of the visible spectrum evidently depends on the *length* of the slit, its length on the difference of refrangibility of red and violet.

If we cut a narrow slit in the screen on which the spectrum falls, in a direction perpendicular to its length, the light which passes through has a definite refrangibility, and can no longer be drawn out by a prism into a spectrum. This experiment also is due to Newton.

If the slit in the shutter be very narrow, and the prism be adjusted to the most favorable position (so that the incident and refracted rays make equal angles with the surfaces on which they impinge, and from which they escape, respectively), we see that after all the solar spectrum is *not* continuous. It is found to be crossed at intervals by dark bands, showing the absence of rays of certain definite refrangibilities. The phenomenon is found to be the same whatever be the substance of the prism; so that these rays are really wanting in sunlight.

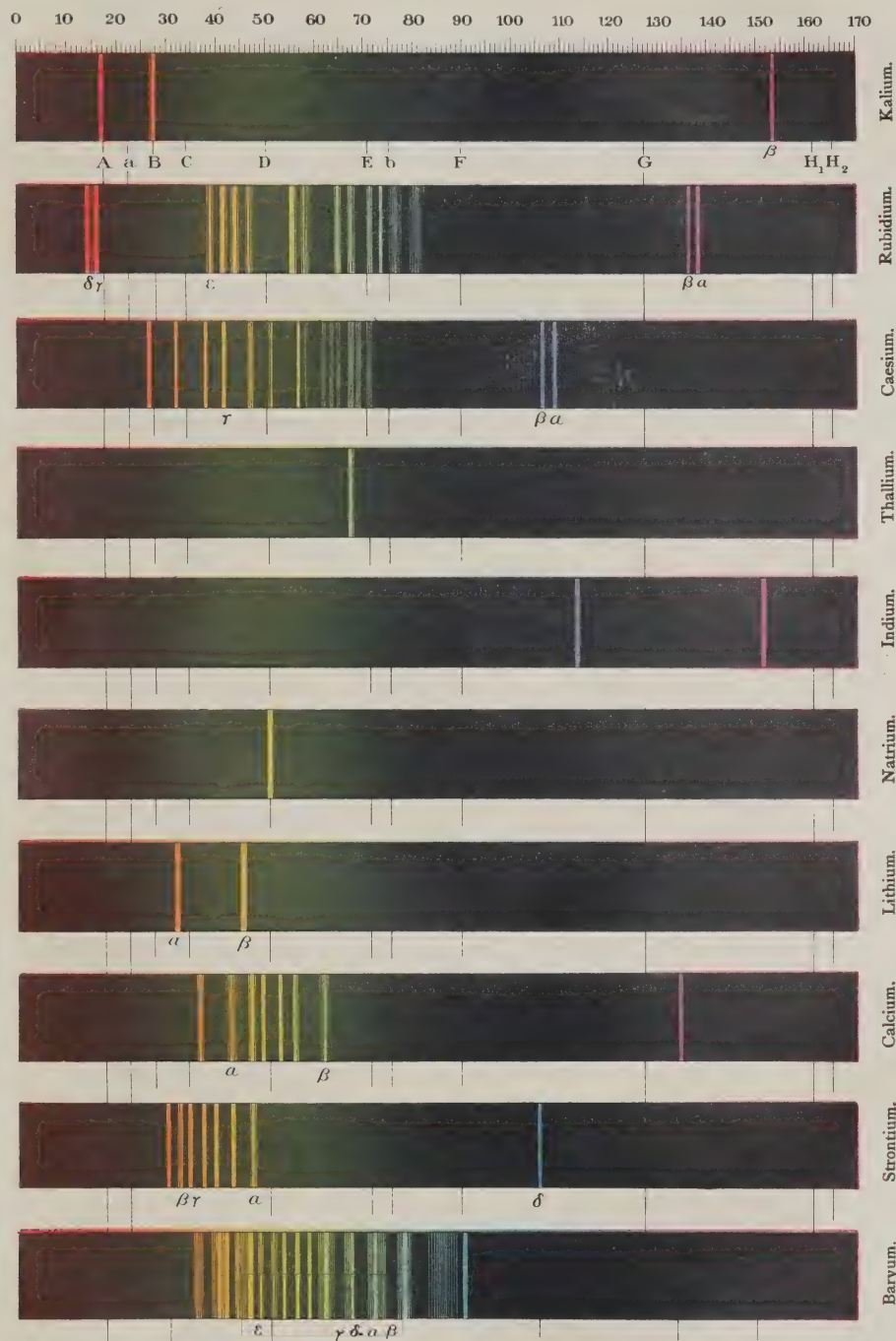
This important discovery was made by Wollaston, but the bands were first carefully observed and measured by Fraunhofer, from whom they are commonly called *Fraunhofer's lines*. We owe to Fraunhofer the invaluable suggestion of employing a telescope to examine the spectrum. The refracted rays are received directly on the object-glass of the telescope, which forms an image of the spectrum to be examined with the aid of the eye-piece, the screen being dispensed with. Wollaston had seen only five lines; Fraunhofer at once discovered four hundred; Brewster, with more perfect apparatus, counted two thousand; and now, with a train of prisms, and powerful telescopes, their number seems beyond computation. They show every variety of breadth and distinctness, and are grouped in the most irregular manner. For reference, Fraunhofer selected some of the more prominent, to which he attached the earlier letters of the alphabet. By their help he was enabled to measure refractory indices (see REFRACTION) with a precision

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SPECTRA OF THE FIXED STARS AND NEBULAE COMPARED WITH THE SUN-SPECTRUM AND THE SPECTRA OF SOME METALS.

SPECTRUM



SPECTRA OF THE METALS OF THE ALKALIES AND ALKALINE EARTHS AFTER BUNSEN AND KIRCHHOFF.

ANALYSIS.

completely unlooked for. If the light of a candle, a bright gas-flame, a white-hot wire, or a lime-ball in the oxyhydrogen flame, be examined in the same way, *no such lines are seen*. But some of them, and others not apparently belonging to sunlight, were found by Fraunhofer in the spectra of various fixed stars—while the light of the moon and planets seemed to give spectra similar to that of sunlight.

The first to throw any light on this subject was Brewster. He showed that when light passed through nitrous acid gas its spectrum was interrupted by countless lines; and that they increased in number and breadth by the application of heat to the gas, so that at a high temperature a thin layer of this gas is *opaque to direct sunlight*. Hence it was natural to conclude that the dark bands in the solar spectrum are caused by absorption in some medium lying between us and the sun. It is to be observed, however, that this is on the supposition that light as it comes immediately from the sun would give, like that of the lime ball, a continuous spectrum. But Brewster went further. He showed that *some* of Fraunhofer's lines depend on the altitude of the sun, that is, on the greater or less space of air, fog, and vapor through which his rays must pass before reaching the earth. *Some of them, then, are caused by absorption in the earth's atmosphere.*

But we must now look to another class of phenomena. A spirit lamp flame gives a very feeble spectrum; and, if a little common salt be put on the wick, although the flame becomes instantly very much brighter, no alteration is produced on the spectrum, save the appearance of a *bright* yellow line, crossing it at the place where the dark line called by Fraunhofer D appears in sunlight. On examining this line carefully Fraunhofer found that it, like D, is double—and he verified that these two rays were exactly (so far as refractive index goes) two of those wanting in sunlight, and in the light of some of the stars.

About the same time Talbot and Herschel (q.v.) showed that the colors given by Lithia, Strontia, etc., in a spirit flame were, like that produced by common salt, due to the production of light of several perfectly definite refrangibilities; so that the spectrum of the lamp-flame was crossed in each case by a series of bright lines always the same when the same body was placed in the flame; and they suggested (in 1825) the application of this method to the qualitative analysis of minerals, etc., when the presence of extremely minute quantities of different bodies has to be ascertained. This was, in reality, the foundation of SPECTRUM ANALYSIS; and the method was, we may say, almost complete, so far as practice is concerned. The theory, however, was left incomplete, so far as regards the cause of dark lines in the solar spectrum. Foucault (in 1849) seems to have been the first to approach the true explanation. An experiment of his, from which, however, he drew no inferences, contains the complete theory. When salt is placed in the voltaic arc (see ELECTRIC LIGHTING) the spectrum gives the double bright line (coinciding with the double dark line D) already referred to. When sunlight passes through this arc its dark line D is *strengthened*, instead of being filled up by the yellow light from the arc as we might have expected; and when one of the white-hot carbon-points (which gives a continuous spectrum) is looked at through the yellow arc, the double dark line D appears in its spectrum.

Stokes learning, in 1850, that experiments had been made by Professor Miller of Cambridge, to test with great accuracy Fraunhofer's assertion as to the exact coincidence of the double bright line of a salted flame with the double dark line of the solar spectrum, gave for the first time the physical explanation of the phenomenon. He compared the salt-flame to a space full of tuning-forks or piano-forte wires all tuned to the same note. When they are in vibration they, of course, give out this note—similarly the salt-flame the *bright* lines. When, however, sounds are produced in their neighborhood, as they naturally vibrate to one definite note, they will be set in vibration by it (i.e., will absorb it) if it be part of the sound.—Thus sound which has passed through such a space has had this note eliminated from it—similarly the salt flame seizes these yellow rays from white light passing through it. This ingenious and satisfactory explanation shows at once that the line D proves the existence of salt (or sodium) in the atmosphere of the sun. Stokes's theory was not published, except in so far as it was annually given by sir W. Thompson (q.v.) in his lectures in Glasgow—so that it was independently discovered, or all but discovered, by various other philosophers some 8 or 10 years later. The earliest of these was Balfour Stewart of the Kew observatory, who proved by reasoning and experiment that a body's absorbing power for any ray of light or heat is equal to its radiating power for the same. Angström all but made the rediscovery. Finally Kirchhoff, by reasoning similar to that of Stewart, and by actually reversing the spectra of certain substances, arrived at the same results; and, in conjunction with Bunsen, applied them to chemical analysis, with the immediate result of discovering two new metals.

One of the most valuable parts of Kirchhoff's investigation is his map of the solar spectrum with its dark lines; side by side with which is a spectrum containing the bright lines given by various metals volatilized in an electric spark. The sunlight is admitted through the upper half of the slit, the light from the burning metal through the lower—and thus the two are subject to precisely the same deflections by the train of prisms.

When there is much moisture in the atmosphere, the solar spectrum shows what is called the *rain-band*. Huggins showed that the spectra of planetary nebulae, and of the

tails of comets, consist of a few *bright* lines only—indicating that these bodies—or, at all events, those portions of them from which their light proceeds—are masses of incandescent vapors or gases.

Again, Stokes has traced, by the alteration of the absorption bands produced by the coloring matter of blood, the oxidation and reduction which constantly take place in this substance, and its connection with the distinction between venous and arterial blood. See Roscoe's *Spectrum Analysis*.

SPECULUM METAL, an alloy of copper and tin, used for making the reflecting surfaces of reflecting telescopes. The best consists of 126.4 parts copper to 58.9 tin. To obtain a perfect alloy, and to cast it successfully, is a matter of great difficulty, requiring much skill and experience. See TELESCOPE.

SPEDDING, JAMES (1808–81), an English scholar, born in Cumberland, Eng. He graduated at, and became honorary fellow of, Trinity college, Cambridge. His life was devoted to the study of Francis Bacon. With R. L. Ellis and D. D. Heath he published (1857–9) the edition of Bacon's works which bears his name, and in 1870 commenced the publication of a *Life and Letters of Francis Bacon*. He published also *Publishers and Authors* (1867); *Reviews and Discussions* (1869), and *Life and Times of Francis Bacon* (1878).

SPEEDWELL, *Veronica*, a genus of plants of the natural order *scrophulariaceæ*, distinguished by a 4-cleft wheel-shaped corolla, with the lower segment narrower, two stamens, and a two-celled capsule. The species are very numerous, annual and perennial herbaceous plants and small shrubs, natives of temperate and cold climates in all parts of the globe. Some of them grow in wet ditches and in marshes, some only on the driest soils. They have generally very beautiful blue, white, or pink flowers. The number of British species is considerable, and few wild-flowers are more beautiful than the germander speedwell (*V. chamædrys*), or the alpine species, *V. alpina* and *V. saxatilis*. A number of species are very generally cultivated in flower-gardens.—The bitter and astringent leaves of the COMMON SPEEDWELL (*V. officinalis*), one of the most abundant British species, found also in almost all the northern parts of the world, are in some countries used as a tonic, sudorific, diuretic, and expectorant medicine. They are also employed, particularly in Sweden, as a substitute for tea; as are those of the germander speedwell.—*V. virginica* is called *Culver's physic* in North America; it is said to be actively diuretic, and a decoction of the fresh root is violently cathartic and emetic.—Brooklime (q.v.) belongs to this genus.

SPEISS, a residue found in the bottoms of crucibles in which smalts or cobalt glass has been melted. It consists of nickel, arsenic, sulphur, with traces of cobalt, copper, and antimony.

SPEKE, JOHN HANNING, an African traveler, was born near Bideford, Devonshire, in May, 1827; was educated at the Barnstaple grammar-school, and at the age of 17 went to India. He entered the native Bengal infantry as a cadet, and saw much service during the war in the Punjab. A keen sportsman, with a taste for natural history, he employed his rifle with success in collecting for the museums specimens of the rarer mammals and birds of India, and with this view he undertook several exploratory trips into the Himalayas. It was while so employed that he first conceived the idea of becoming an African traveler. The English government had resolved, in 1854, to dispatch an expedition from Aden into the neighboring region of Africa, under the command of capt. Burton (q.v.). Speke, then a lieut. in the Indian army, reached Aden at this time, on leave of absence, and resolved to join Burton and his companions, lieuts. Herne and Stroyan. Burton went to Harar; and Speke was detached to visit the Dalbahantas, the most warlike of the Somaui tribes. On the return of the travelers to their starting-point on the coast, they were attacked by 150 men. Stroyan was killed, and Speke made a narrow escape with 11 wounds. The attention of the geographical society of London had now been called to the subject of the great lakes of tropical Africa; and in June, 1857, they dispatched Burton and Speke. These travelers entered the country from Zanguebar, as the German missionaries Krapf and Rebmann had done in 1847, and discovered the great lake Tanganyika. The details of their discoveries till they reached Gondokoro, in Mar., 1863, are given in the article NILE. On Sept. 15, 1864, Speke was killed by a gun-accident while out shooting in the neighborhood of Bath.—Speke is the author of a *Journal of the Discovery of the Source of the Nile*, and *What led to the Discovery of the Source of the Nile*.

SPELLING REFORM. In respect of orthography English is the most abnormal of tongues (see PHONETIC WRITING). No one on seeing a word for the first time knows how to pronounce it, or, on hearing it, how to write it. Children cannot learn to read or spell without wasting years that ought to be given to acquiring knowledge. Our spelling, originally phonetic, became corrupted, (1) by retaining letters that have become silent; as in *know*, *psalm*; (2) by having the same symbol for divergent or dissimilar sounds, as a in *ale*, *add*, *arm*, *ask*, *all*, *what*; *ough* in *cough*, *dough*, *through*, *plough*, *enough*, *hiccough* and Scottish *sough*; (3) different symbols for sounds that have converged; as in *name*, *fail*, *weight*, *great*.

Many isolated efforts have been made to remedy this. At length the subject has

attracted the notice of our foremost philologists, as Ellis, March, Murray, Whitney, Müller, Sweet, etc., and the English and American Spelling Reform associations are the result. In 1881 the English Philological assoc. proposed certain corrections which have been generally approved by the American assoc. We summarize the principal.

Drop silent letters where phonetically or etymologically useless, as *e* from *are*, *come*, *assemble*, *medicine*, *driven*, *barred*, *heart*, *yeoman*; *a* from *breast*, *beat*, *beauty*; *o* from *jeopardy*, *country*; *i* from *parliament*; *u* from *honour*, *guess*, *bought*; *ue* from *catalogue*, *tongue*; *b* from *limb*, *thumb*; *c* from *scent*, *scythe*; *h* from *aghast*, *ghost*; *l* from *could*; *s* from *island*; *t* from *witch*; *w* from *whole*. For *centre*, *theatre*, write *center*, *theater*; for *expence*, *defence*, *pence*, *expens*, *defens*. *pens*; change participial *ed* into *t* after unvoiced consonants, as *missed*, *mist*; *looked*, *lookt*: Substitute *f* for *gh* in *draught*, *cough*, and for *ph* in *philosophy sphere*; *z* for *s* in *risen* (*rizen*). Do not double final *b*, *d*, *g*, *n*, *r*, *t* after short vowels, nor *f*, *l*, *z* where unnecessary. Respell abnormal words as *phthisical* (*tizikal*), *comptroller* (*kontroler*), *tongue* (*tung*).

The objection to this reform, that it is unetymological, is met by the allegation that it is urged by the foremost etymologists of the age, and the doubts regarding its practicability are met by the examples of similar reforms having been successfully carried out in ancient Greece and in Holland and Spain. The partial and conservative change advocated would still, however, cause the justly dreaded confusion. The essential to its success is that it be adopted in our school-books and gradually by the press, and this will probably not occur.

SPELMAN, Sir HENRY, 1562-1641; b. England; studied at Trinity college, Cambridge; studied law at Lincoln's inn; was knighted by James I.; retired to London in 1612 to devote himself to antiquarian research; published in 1626 the first part of *Glossarium Archæologicum*; next, an edition of *English Councils*. His *Treatise Concerning Tithes* and *History of Sacrilege*, are valuable. His posthumous works were issued at Oxford in 1698 under the title *Reliquiæ Spelmannianæ*.

SPELT. See WHEAT.

SPELTER. See ZINC.

SPENCE, JOSEPH, 1699-1768; b. England; educated at Oxford; fellow, 1722; ordained, 1728; became rector of Birchanger, Essex, and professor of poetry in the college; traveled, 1730-33, in France and Italy; re-elected, while absent, professor of poetry; traveled again, 1739-42; rector of Great Horwood and professor of modern history at Oxford; prebend of Durham cathedral, 1754. His publications are *Polymetis*; *Anecdotes*, *Observations*, and *Characteristics of Books and Men*; *Essay on Pope's Translation of Homer*.

SPENCER, a co. in s.w. Indiana, bounded on the s.e. and s.w. by the Ohio river, crossed by the Louisville, Evansville, and St. Louis railroad; about 390 sq. m.; pop. '90, 22,060. Co. seat, Rockport.

SPENCER, a co. in n. Kentucky, drained by the Salt fork of the Ohio river and Clear creek, the former bounding it on the n.e.; 200 sq. m.; pop. '90, 6760, chiefly of American birth. Co. seat, Taylorsville.

SPENCER, a town in Worcester co., Mass.; on the Boston and Albany railroad; 12 miles w. of Worcester. It was incorporated in 1753; contains several villages; and has the David Prouty high school, the Richard Sugden public library, Spencer public park, electric lights and street railroads, and manufactories of boots, shoes, wire, woolen goods, and satinet. Pop. '90, 8747.

SPENCER, AMBROSE, LL.D., 1765-1848; b. Conn.; educated at Yale and Harvard, and called to the bar. He settled in the state of New York, and was a member of both branches of its legislature. He was attorney-general of the state, 1802-4; associate justice of the state supreme court, of which he was chief justice, 1819-23. He was subsequently member of congress and mayor of Albany.

SPENCER, GEORGE ELIPHAZ, b. Jefferson co., N. Y., 1836; was educated at Montreal college, Canada; was admitted to the Iowa bar, 1856. He was secretary of the Iowa senate, 1858. He entered the union army as capt., 1862; commanded a brigade of cavalry on Sherman's march to the sea, and was brevetted brig.-gen. for gallantry; settled in Alabama, 1865, and was elected U. S. senator, as a repub., 1868, and re-elected, 1872. He aided in the exposure of the star-route frauds, and advanced the legislation leading to the reduction of letter postage to two cents. In 1881 became commissioner of the Union Pacific railroad.

SPENCER, GEORGE JOHN, D.C.L., 2d Earl, 1758-1834; b. England; succeeded to the title in 1821. He was 1st lord of the admiralty, 1794-1801, and afterward home secretary. His private library was one of the best in Europe.

SPENCER, HERBERT, English scientist, b. in Derby in 1820. He was educated by his father, W. G. Spencer, a teacher, chiefly of mathematics, and his uncle, the rev. Thomas Spencer, a clergyman of the established church, well known for his liberal opinions on political and ecclesiastical questions. At the age of 17 he became a civil engineer; but after about 8 years abandoned the profession, in consequence of the large influx of young men brought into it during the railway mania, and the consequent undue competition. During the 8 years of his engineering life he contributed various papers to the *Civil Engineers' and Architects' Journal*. His first productions in general

literature were in the shape of a series of letters on the "Proper Sphere of Government," published in the *Nonconformist* newspaper in 1842, which were some time after reprinted as a pamphlet. From the close of 1848 to the middle of 1853 he was engaged on the *Economist*, then edited by the late James Wilson, M. P.; and during this time he published his first considerable work, *Social Statics*. Shortly afterward he began to write for the quarterly reviews, most of his articles appearing in the *Westminster*, and others in the *North British*, *British Quarterly*, *Edinburgh*, *Medico-chirurgical*, etc. In 1855 appeared his *Principles of Psychology*. In 1860 he commenced a connected series of philosophical works, designed to unfold in their natural order the principles of biology, psychology, sociology, and morality. To this series belong, besides the *Psychology* (2 vols., new ed. 1871-72), *First Principles* (1862, 2d. ed. 1867); *Principles of Biology* (1864); *Principles of Sociology* (parts 1 to 4, 1876-80); and *The Data of Ethics* (part of *Principles of Ethics*, 1879). *Education* was published in 1861; *The Study of Sociology* in 1872; and *Descriptive Sociology* in 1873-78; *Negative Beneficence and Positive Beneficence* (1893); *Rejoinder to Professor Weissmann* (1894); *Weissmann Once More* (1895). The last volume of the *Principles of Sociology*, completing the scheme of the great philosophical work which he had set himself, appeared in Nov., 1896. Spencer has developed and applied universally the theory of evolution, and of late years has published *Ceremonial Institutions* (1879); *Political Institutions* (1882); *Ecclesiastical Institutions* (1885), these being parts of the *Principles of Sociology*; *Essays: Scientific, Political and Speculative* (4 vols.); *The Insuperable Book*, etc. He visited the U. S., 1882, but at his own earnestly expressed desire was suffered to make the tour of the principal American cities with comparative immunity from the newspaper reporter, and lion-hunter. In 1883, May 12, he was elected a correspondent of the French acad. of moral and political sciences for the section of philosophy, filling the place left vacant by the death of Ralph Waldo Emerson. In 1884 he was engaged in a controversy with Frederic Harrison, in the pages of the *Contemporary Review*, on the personality of God and the nature of religion. The publication of these essays in book form in the U. S., 1885, threatened at one time to bring about a personal rupture between S. and Harrison, who claimed that his rights in the joint authorship of the essays had been violated, but Mr. S.'s explanation was accepted as satisfactory.

S. has attempted to work out a complete system of philosophy in harmony with the principles and results of modern science. His philosophy is essentially speculative or deductive. It does not begin with observation and experiment, and rise through them to scientific generalizations. It starts with certain truths supposed to be ultimate, the test in all cases being the mental inconceivability of the opposite of the proposition; and seeks to explain phenomena from this assumed standpoint. He accepts the doctrine of relativity, which Hamilton and Mansel deduced from Kant, but carries it a step further. Though we can have definite consciousness of things only in their relation to each other, not as they are themselves—that is, of the relative and not of the absolute—such definite consciousness implies an indefinite consciousness of an absolute existence. In the recognition of this as inscrutable, science and religion find their reconciliation. Now, the manifestations of this unknowable power constitute what have just been called things in their relation to each other, of which we can have definite consciousness or knowledge: knowledge completely unified is philosophy. The data of philosophy are necessarily those organized components of our intelligence without which philosophizing could not go on. "Our postulates are: an unknowable power; the existence of knowable likenesses and differences among the manifestations of that power; and a resulting segregation of the manifestations into those of subject and object." Within each segregated mass there are likenesses and differences involving secondary segregations. The modes of cohesion under which manifestations are invariably presented are called, when contemplated apart, space and time; when contemplated with their manifestations, matter and motion. All these are traceable to experiences of that mode of consciousness whose reality is shown by its persistence—to force. By the "persistence of force" is meant the unchanging quantity, both of that mode of force which is revealed to us only by opposition to our own powers, and is not a worker of change, and of that mode which is a worker of change, actual or potential, and is specifically called energy. The persistence of force—that is, the persistence of some cause which transcends our knowledge and conception—is the truth which all other truths imply, and from which they all (including the law of evolution) are derived. From the fact that force can neither arise out of nor lapse into nothing, follows the uniformity of law. Force never disappears, it is only transformed. Motion follows the line of least resistance, and is perpetually reversed within limits—is rhythmical. So far of the factors of phenomena. The phenomena themselves must be under a law of the concomitant redistribution of matter and motion, which holds of every change. The law of the entire cycle of changes passed through by every existence is loss of motion and consequent integration, *i. e.*, evolution, eventually followed by gain of motion and consequent disintegration, *i. e.*, dissolution. In its complete shape the "formula of evolution" is thus stated: "Evolution is an integration of matter and concomitant dissipation of motion, during which the matter passes from an indefinite, incoherent homogeneity to a definite coherent heterogeneity; and dur-

ing which the retained motion undergoes a parallel transformation." This law of evolution applies equally to all orders of phenomena—whether "astronomic, geologic, biologic, psychologic, etc."—since these all are component parts of one cosmos, though distinguished from one another by conventional groupings.

To the uniformity of law is due the genesis of our own ideas and the growth of our knowledge. The succession or co-existence of external phenomena produces a like succession or co-existence in our mental perceptions, and when any two physical states often occur together there is at length established an internal tendency for these states always to occur in the same order. All mental states—including those primary scientific ideas, the perceptions of matter, motion, space, and time—can be analyzed into a primitive element of consciousness, something which can be defined only as analogous to a nervous shock. These perceptions have now become innate in the individual. They may be called—as Kant called space and time—forms of intuition, but they have been acquired empirically by the race, through the persistence in the order or relationship of events in the environment, and from the accumulated experiences of each individual being transmitted in the form of modified structure to his descendants. From the lower phenomena of reflex action and instinct our unconscious life gradually merges in a succession of conscious phenomena, and we are borne upward through the regions of memory to the highest exercise of reason and normal development of feelings. The principles of morality are looked on by S. as the keystone of his system, all his other investigations being only preliminary to them. Ethics, he holds, has its root in physical, biological, psychological, and social phenomena, for by them the conditions of human activity are prescribed and supplied. The best conduct is that which most fully realizes evolution—which promotes the greatest totality of life in self, offspring, and fellow-men—the balance of egoism and altruism being attained by a compromise between these contending principles. The measure of life is said to be pleasure, but the utilitarian school are at fault in assuming that the end (greatest happiness) is better known than the means to it (morality); and for ignoring the fact, that accumulated experiences of utility have become consolidated in the race into a moral sense.

In the above summary, it has been impossible to give any idea of either the strength or weakness of the proof by which this elaborate system is supported. In general it may be said that its strength lies in the author's brilliant powers of generalization, his acquaintance with various departments of science, and his unsurpassed wealth of illustration. But a clear analysis of the notions which he employs is often wanting. Hence the unsatisfactoriness of the distinction between definite consciousness or knowledge, and the indefinite consciousness implied by it, which is not knowledge; the want of any proved relation between his objective and subjective aspects of psychology, the implicit assumption at the outset of the perception of space, etc., when the attempt is being made to show how they have been gradually produced in the mind by the action of the environment. Thus, too, in the *Sociology* the ethnographical method is followed to the exclusion of the more scientific historical method; and in the *Data of Ethics*, the compromise between egoism and altruism is left wholly indeterminate.

The wide knowledge which all S.'s writings display of physical science, and his constant endeavor to illustrate and support his system by connecting its position with scientific facts and laws, have given his philosophy great currency among men of science—more so, indeed, than among philosophical experts. At the same time, not only have the development and application that he has given to the theory of evolution profoundly affected contemporary speculation, but also he must be regarded as one of the few in history who have carried out the attempt to give a systematic account of the universe in its totality.

SPENCER, ICHABOD SMITH, D.D., 1798-1854; b. Vt.; graduated at Union college, 1822; studied theology with Prof. Yates; taught at Schenectady and Canandaigua; settled 1828, as colleague of the Rev. Solomon Williams, Northampton, Mass.; pastor of Second Presbyterian church, Brooklyn, N. Y., 1832; was professor extraordinary of biblical history in Union seminary, 1836-40; was invited to the presidency of the university of Alabama, 1830, of Hamilton college, 1832, professorship of pastoral theology, East Windsor seminary, 1853, and received calls from important churches, but declined all. He published *Pastor's Sketches*, 2 vols., and after his death appeared *Sacramental Discourses; Sermons; Evidences of Divine Revelation*. He was a man of positive character, of clear theological views, and great pastoral fidelity and success.

SPENCER, JESSE AMES, D.D., b. N. Y., 1816; graduated at Columbia college, 1837; studied theology at General theological seminary; ordained, 1840; rector of St. James's church, Goshen, N. Y.; traveled in Europe, 1842; visited Egypt and Palestine, 1848-49; professor of Latin and oriental languages at Burlington college, N. J., 1849-50; editor and secretary of the Episcopal Sunday-school union and church book society, 1851-57; rector of St. Paul's, Flatbush, L. I., 1863-65; professor of Greek in college of city of New York, 1869. He has published *Discourses; History of English Reformation; The New Testament in Greek, with Notes; Egypt and the Holy Land; History of United States*, 4 vols.

SPENCER, JOHN, D.D., an English theologian and scholar, was born in 1630 and became Dean of Ely. He was the author of a work on the laws and of the Hebrew ritual, written in Latin. He died in 1695.

SPENCER, JOHN CANFIELD, LL.D., 1788-1855; b. Hudson, N. Y.; son of chief-justice Ambrose Spencer; graduate of Union college, 1806; private secretary to gov. Tompkins, 1807. He studied law and commenced practice in Canandaigua, but removed to Albany, 1845; master in chancery, 1811. In 1813 he was on duty at the frontier as brigade judge-advocate; in 1814 postmaster of Canandaigua; in 1815 assistant attorney-general for w. New York; member congress, 1817-19. He was for some years member of the assembly or in the state senate. An anti-mason, he was government prosecutor against the supposed abductors of Morgan. In 1839-41 he was secretary of state; U. S. secretary of war under president Tyler; secretary of the treasury, 1843; resigned 1844 and resumed private practice. He was a zealous promoter of common-school education and all charitable objects. He edited the first American edition of De Tocqueville's *Democracy in America*.

SPENCER, JOHN CHARLES, Earl, English minister and statesman, son of the second earl, was b. in 1782. The founder of the family of the Spencers was the hon. John Spencer, youngest son of the third earl of Sunderland, by Anne, daughter and co-heiress of the great duke of Marlborough, and who inherited much property from his grandmother, Sarah, duchess of Marlborough. His only son was made earl Spencer in 1765.—The second earl was first lord of the admiralty under Mr. Pitt's administration—1794 to 1801—the period of the great naval victories of Camperdown, cape St. Vincent, and the Nile. He retired when Mr. Addington became premier, and became distinguished as a munificent collector of rare books. He was also first president of the Roxburghe club for reprinting rare and curious tracts.—The third earl, the subject of this notice—better known under the courtesy title of lord Althorp—was educated at Harrow school, and afterward at Trinity college, Cambridge. He entered parliament in 1804 as member for Oakhampton. In 1806 his father took office as secretary of state for the home department in the Grenville-Fox ministry, and Spencer became a junior lord of the treasury. He was returned for Northamptonshire, which he represented from 1806 until the period of the reform bill. In the reformed parliament he sat for the southern division of the county. He went out with the whigs in 1807, and during the long interval of their exclusion from office, steadily opposed the measures of the tory government. On the dissolution of the Wellington cabinet in Nov., 1830, he was appointed chancellor of the exchequer and leader of the house of commons in the celebrated reform ministry of earl Grey. The reform bill was introduced by lord J. Russell (q.v.), but the task of carrying the bill mainly devolved upon Spencer. In 1833 he brought in and carried the ministerial bill for reforming the Irish church. In this memorable working session, the curious statistician discovered that Spencer, who had, from his post of ministerial leader, naturally been the most frequent speaker, had addressed the house 1026 times, his speeches occupying 387 columns in the then *Mirror of Parliament*. In 1834 he introduced and obtained the assent of the legislature to the poor-law amendment act. When the Irish coercion bill was under consideration in the cabinet, Spencer had opposed the clauses prohibiting public meetings, yet had given way rather than break up the ministry; but when the truth was elicited in debate by Mr. O'Connell, Spencer resigned. He was considered and described by earl Grey as his "right-hand man," and without his assistance the earl felt himself unable to carry on the government. The administration of viscount Melbourne succeeded (July, 1834), in which Spencer consented to resume his office. In November he was called by the death of his father to the house of peers, which had the effect of bringing the Melbourne (q.v.) administration to an end. When the attempt of sir R. Peel to carry on the government failed, Spencer declined to take office again. He devoted his time to agricultural pursuits, became president of the Smithfield Cattle club, and suggested the formation of the royal agricultural society, of which he was elected president in 1838. He died at his seat, Wiseton hall, Notts, Oct. 1, 1845, without issue, and was succeeded by his brother. During his political career, his simplicity of character and integrity of purpose obtained for him the appellation of "honest lord Althorp." He was very little of an orator, but he had a clear and practical intellect, and his influence over the reformed house of commons was supreme. Lord Brougham dedicated to him his work on *Natural Theology*; and his *Dialogues on Instinct* are also supposed to be carried on with Spencer, to whose cultivation of philosophy in the midst of his political and agricultural pursuits, the author bears friendly testimony. See *Memoir* by sir Denis le Marchant, Bart. (London, 1876).

SPENCER, JOHN POYNTZ, fourth Earl Spencer, was born in England in 1835, educated at Cambridge, lord lieutenant of Ireland 1869-74 and again in 1882-85; and lord president of the council, with a seat in Mr. Gladstone's cabinet 1880-3 and 1885-6, first lord of admiralty 1892-5.

SPENCER, JOSEPH, 1714-89; b. Conn.; was judge of probate, 1753; joined the northern army, 1758, as maj. under Col. Whiting; was a member of the council, 1766, brig.gen. in continental army, 1775; maj.gen., 1776; was with the army in the expedition against Rhode Island, 1778; assisted in Sullivan's retreat; elected to congress, 1779 again elected to the council, 1780. He was greatly esteemed by Washington.

SPENCER GULF, a very large inlet on the coast of s. Australia (q.v.), between Eyria and Yorke peninsulas. It is about 209 m. in length, by 100 m. in greatest breadth.

SPENCER RIFLE. The principal characteristic of this arm is a magazine in the butt of the stock which holds seven cartridges, and from which the chamber is supplied by a movement of the trigger-guard. This acts as a lever, expelling the shell of the exploded cartridge, while it replaces it by a fresh one. The magazine when emptied is exchanged for a full one; or, by a simple movement, it can be shut off altogether, and the rifle made a single breech-loader. This rifle, which is described as a "breech-loading magazine gun," was generally used by the union cavalry during the war of 1861-65. See *illus.*, GUNS, vol. VII.

SPENER, PHILIPP JAKOB, a German reformer, and the founder of the sect known as *Pietists*, was born at Rappoltsweller (Fr. Ribeauville), in Upper Alsace, Jan. 25, 1635. His father was legal adviser to the Count von Rappoltsweller. At an early age Spener showed deep religious susceptibilities. After studying the classics at Colmar, he betook himself in 1651 to Strasburg, where the professors Dannhauer and Seb. Schmidt inspired him with a profound love of the Scriptures, not as a heap of dry theological bones, but as a fountain of life and spiritual thought. From 1659 to 1662 he attended the universities of Basel, Tübingen, Freiburg, Geneva, and Lyons. In the following year he became a preacher at Strasburg, where the unction of his sermons exercised a powerful influence on his hearers. At the age of 31 he was transferred to Frankfurt as first pastor; and here, as elsewhere, the profound spiritualism of the man, springing out of a free, simple, *untheological* faith in the Bible, made itself apparent in his preaching and life. Yet Spener was the very opposite of what is commonly called a *mystic*. The devotions which he sought to excite were not to show themselves in transcendental ecstasies, amid which common sense is apt to swoon away, but in acts of piety, humility, and charity. The "Sermon on the Mount" was the medium through which he gazed upon the "truth as it is in Jesus." He had a strong aversion to what goes by the name of theology, which he considered a hateful caricature of the free word of life; and he commenced in the year 1670, at his house, meetings for the cultivation of evangelical morality. These were the famous *collegia pietatis*, whose influence for good on the German character, in those days of stony and barren orthodoxy, cannot easily be overvalued. At the same time he took pains to reorganize the method of catechising, and to improve the religious instruction given to children. His conduct in all this was marked by such prudence and discernment, that he long escaped the animadversions of the "high and dry" Lutherans; but in 1679, a preface which he wrote for a new edition of the *Postille* of Arndt, in which he censured the morals of the upper classes, made him the target for their envenomed shafts; and after some years, he was fain to accept the invitation to become court-preacher at Dresden, and member of the upper consistory. In this capacity he effected important ameliorations in the theological teaching of the university of Leipsic, and in the system of religious catechising practiced throughout Saxony; but in 1689 he fell into disgrace for having addressed a temperate but energetic remonstrance to the elector Johann Georg III. on the subject of his personal vices, was attacked by Carpzow, who coveted his place at court, and by other orthodox theologians, and in 1691 went to Berlin as provost of the church of St. Nicholas, and consistorial inspector, offices which he retained to the end of his life. The elector of Brandenburg encouraged his efforts after religious reform, and intrusted theological instruction in the new university of Halle to Franke, Breithaupt, and other disciples of Spener—a matter that excited great irritation in the theological faculties of Wittenberg and Leipsic, which had formally censured as heretical no less than 264 propositions drawn from Spener's writings. Spener died at Berlin, Feb. 5, 1705, leaving behind him a reputation for piety, wisdom, and practical Christian energy, which all the excesses of the later pietists have not obscured. His writings are numerous; the chief are *Pia Desideria* (Frankf. 1675), *Das geistliche Priesterthum* (Frankf. 1677), *Christliche Leichenpredigten* (13 vols., Frankf. 1677), *Des thätigen Christenthums Nothwendigkeit* (Frankf. 1679), *Klagen über das verdorbene Christenthum* (Frankf. 1684), *Evangelische Glaubenslehre* (Frankf. 1688), and *Theologische Bedenken* (Halle, 5 vols., 1700-21). See Hossbach's *Phil. Jak. Spener und seiner Zeit* (2 vols., Berl. 1828); Thilo's *Spener als Katechet* (Stutt. 1841); and Wildenhalm's *Phil. Jak. Spener* (Leip. 1842-47).

SPENSER, EDMUND, one of the chief literary ornaments of the great Elizabethan period, was born in London in the year 1552. There is some ground for supposing him to have been of good family connection; but inasmuch as of neither of his parents is anything whatever known, the evidence of this is precarious. In 1569 he went to Pembroke Hall, Cambridge, in the humble capacity of sizar, in itself a sufficient proof that whatever his family, the gifts of fortune were deficient. At Cambridge he remained several years, becoming bachelor of arts in 1572, and master in 1576. After leaving college, he went to live with friends in the n. of England. Of the detail of his life at this period, nothing is known further than that he busied himself with poetry, his first volume of which, *The Shepheard's Calendar*, was published in 1579. Its dedication to sir Philip Sidney was the means of introducing him to that noble and kindly gentleman, who not only extended to him a generous patronage, but honored him with his warm friendship. He seems for some time to have been domesticated with sir Philip at Leicester house, from which he dates his moiety of the *Four Epistles*, exchanged be-

tween him and Gabriel Harvey, and printed in 1580. Toward the end of this year, through the influence of Sidney's uncle, the earl of Leicester, an appointment was procured for him as secretary to lord Grey of Wilton, the queen's deputy in Ireland, whither he at once proceeded. About this time it was that he commenced his great work, *The Faery Queen*. His official duties must have been punctually and ably performed, as in 1586 we find his services rewarded by a grant from the crown of Kilcolman in the county of Cork, an estate of upward of 3,000 acres, on which he now went to reside. Along with this piece of good fortune came the evil news to him of the death of his friend Sidney at Zutphen, an event which he musically bewails in the elegy entitled *Astrophel*. Subsequently the place of Sidney, as at once his patron and friend, was in a measure supplied by sir Walter Raleigh, who visited him in Ireland in 1590, took him along with him to England, and introduced him to the notice of queen Elizabeth. His experiences as a suitor for court-favor seem not to have been specially of a pleasant kind, if we may judge from a passage in one of his works, in which a keen personal feeling of wrong and weary humiliation speaks out unmistakably. Documentary evidence exists, however, that a pension of £50 per annum was granted him by queen Elizabeth; that it was ever paid, or paid with due punctuality, there seems considerable reason to doubt. That Elizabeth, along with her greater qualities, could exhibit on occasion an extreme meanness and stinginess, there is no reason to doubt whatever. What portion of Spenser's after-life was passed in England, what in Ireland, we do not distinctly know. Nearly all we distinctly know of him henceforth is the date of his several publications. The first three books of *The Faery Queen*, issued on his arrival in England in 1590, were followed the year after by three more, and a collection of lesser pieces entitled *Complaints*, including *Mother Hubbard's Tale*, the *Tears of the Muses*, etc.; and in 1596 by four *Hymns*, so called, in which the Platonic doctrine of beauty is elaborated in noble music. In 1596 he wrote his *View of Ireland*, a treatise full of sagacious observation and remark, which was only published long after in Dublin in 1633. Further than this, all record which survives to us of Spenser is summed in the facts that in 1594 he was married to a woman whose very name has perished; that in 1598 he was made sheriff of Cork by the queen; and that in the course of the same year the deplorable calamity befell him which shortly preceded and in part may have caused his death. Tyrone's rebellion having broken out, his house at Kilcolman was sacked and burned by the rebels, he and his wife with difficulty escaping, while their youngest child perished in the flames. On Jan. 15, 1599, his death took place in London. According to the account given by Ben Jonson to Drummond, he "*died for lack of bread.*" This is not likely to have been in the literal sense true, but it is scarce possible to evade the inference from it, as coming from one so likely to be well informed as Jonson, of a state of great wretchedness and destitution. He was buried by his own request near Chaucer in Westminster Abbey, at the expense of the earl of Essex, who is said, in the account by Jonson, to have tendered him succor on his death-bed, though too late to be of any avail.

Spenser takes admitted rank as one of the very greatest of English poets; and his chief work, the *Faerie Queene*, written in that stateliest of English measures, since known by the name of its inventor, tedious as it is in its allegory, and in much of its diction obsolete even when written, is a masterpiece of opulent genius. In the poetry of Spenser, an ever-present seeking for and sense of beauty finds its fit expression and reflex in a fluent succession of sweet and various cadences; in breadth and splendor of pictorial effect, it has never, perhaps, been surpassed; such a lavish exuberance in detail as we find in it, has seldom been so combined with a total impression of chastened and majestic sobriety; and throughout it is pervaded by that atmosphere of moral wisdom and serenity which Milton reverently recognizes in "the sage and serious Spenser."—See *Spenser and his Poetry*, by Prof. G. L. Craik (3 vols., 1845). The most complete editions of the poet's works are those by Todd (1806) and Collier (1862); but a new edition by Grosart, and others appeared in 1882. Church's short life of S. is admirable.

SPENSERIAN STANZA. See METER.

SPERANSKI, MIKHAIL, Count, 1772-1839; b. Russia; prof. of mathematics at St. Petersburg in 1797, and sec. to the council of the empire in 1801. He became asst. minister of justice in 1808. During his administration he remodeled the system of taxation, introduced a new penal code and a system of national education. He was banished in 1812, but recalled in 1816. He became president of chancery under Nicholas.

SPERMACETI is a waxy substance obtained from cavities in the head of the sperm whale, *physeter macrocephalus*. In the living whale it is dissolved in an oil, but on cooling separates as a solid. As much as twelve barrels of crude spermaceti are obtained from an ordinary whale. It is purified by pressure, melting, and crystallization. It is white or translucent, crystallizable from alcohol and ether, not soluble in water, smooth to the touch, and without taste or odor. It becomes rancid and grows yellowish on exposure to light. It burns with a bright flame. Its specific gravity is .943, and its melting point between 45° and 50° C. (113° to 122° F.). It does not, like fats and oils, give glycerine after saponification, but cetyl alcohol. It consists chiefly of cetin, or cetyl palmitate, $\left. \begin{matrix} C_{16}H_{31}O \\ C_{16}H_{33} \end{matrix} \right\} O$; but from its decompositions seems to contain also lauric, myristic, and stearic acids in small quantities, combined with alcohols of the same name.

Spermaceti has been used in medicine as a demulcent or soothing application to mucous membranes, but has manifested no particular virtue. It is, however, used as an ingredient of many ointments and cerates. It is made into sperm candles of definite weight for photometric purposes.

SPERMATOZO A is the term given to the true fertilizing agents occurring in the male generative organs. They appear to be formed from the epithelial lining of the tortuous seminal tubes, of which the organ known as the *testis* is essentially composed. At the period of puberty in man, and at certain periods annually in other animals, the seminal tubes are seen to be filled with cells, from which the spermatozoa are developed. Without describing the various changes that ensue, we may observe, that the spermatozoa are finally set free by the bursting of the cell-walls, and arrange themselves in parcels symmetrically placed, with the so-called heads in one direction, and the tails in the opposite direction. In the human subject, the spermatozoa may be described as clear, hyaloid bodies, each of which consists of a dilated portion, the head or body, from which a long tail, or filament, issues. The head is flattened from side to side, and of a conical form, the pointed extremity being anterior. The length of the spermatozoa is about $\frac{1}{800}$ of an inch. The spermatozoa of different animals vary extremely in size and form; and for a detailed account of these bodies, in different classes of animals, we must refer to the article "semen," in the *Cyclopædia of Anatomy and Physiology*. It was formerly supposed that spermatozoa were independent organisms (like the infusoria for example), but it is now known that they must be regarded as epithelial cells (or perhaps nuclei), modified in structure, and endowed with special properties. That the integrity of the spermatozoa is essential for the process of impregnation, is a fact that cannot be called in question; but of the nature of the force which they communicate to the ova, we know nothing.

SPEY, a river in Scotland, between Badenoch and Lochaber, expands into the small Loch Spey, 6 m. n.w. of loch Laggan, follows a north-eastern direction through the counties of Inverness and Elgin, and, after a course of about 110 m., falls into the Morey firth, 3 m. w. of Port-Gordon. During a portion of its lower course, it forms the boundary between the counties of Elgin and Banff. In point of length, the Spey is the second river of Scotland, but except for its salmon-fisheries, it is almost without value, nor can it be called a picturesque stream. It has the swiftest current of all the large rivers in Britain, and is subject to sudden and violent freshets, resulting at times in disastrous inundations. Its salmon-fisheries are very valuable.

SPEYER, also **SPIER** (Fr. *Spires*), the capital of Rhenish Bavaria (the former Palatinate), and one of the oldest towns in Germany, stands at the influx of the Speyerbach into the Rhine, 16 m. s.w. of Heidelberg, and 23 n. of Carlsruhe. It is connected with Mannheim, and thence with the rest of Germany, by railway. The principal building is the cathedral (founded 1030), which contains the tombs of numerous emperors of Germany. Since 1854 it has been wholly renewed, and is the grandest specimen of Romanesque architecture in Europe. The interior is adorned with 32 magnificent frescos by Schraudolph.

Except the cathedral and a ruined wall, the sole relic of the imperial palace in which twenty-nine diets were held—at one of which (1529) the reformers made their famous "protest," and got for themselves the name of Protestants (see **PROTESTANT**)—Speyer does not contain a single ancient building. This is owing to the fact that in the Orleans succession war—well called by the Germans the *Mordbrenner Krieg*—during which the whole Palatinate was savagely wasted, Speyer was taken by the French, its inhabitants driven out, and the city blown up with gunpowder, and burned to the ground. Only the cathedral resisted the barbarous efforts to mine it. Everything else was reduced to rubbish, and for long years the noble old pile overlooked nothing but a melancholy waste of ruins. In 1794 it was wasted by the French under Custine, and has never recovered from these calamities. Speyer manufactures vinegar and tobacco, and has some transit-trade on the Rhine. Pop. '85, 16,064, of whom about two-fifths are Catholics.

Speyer is the *Noviomagus* of the Romans, and was the capital city of the Nemetes, a German people. Speyer was probably the native name from the first, for in some of the later Roman notices it is called *Civitas Nemetum, id est Spira*. The name is derived from the stream, or *bach* (Speyerbach), which here flows into the Rhine. A Christian community appears to have been established here as early as 150–200 A.D., and it was certainly the seat of a bishop about 300 A.D. The German emperors had here a *pfalz* (palace, Lat. *palatium*, whence the former name of the region of which it was the capital, the Pfalz or Palatinate), in which they often resided. By them the town was made a free city of the empire; and having obtained the monopoly of the carrying-trade up and down the Rhine, it rapidly rose in wealth and importance. The *Reichskammergericht*, or imperial chamber of justice, the highest court of the German empire, was held here for 200 years, until removed to Wetzlar in 1689. Speyer has been twice in possession of the French, but has belonged to Bavaria since 1815.

SPEZIA, a city of northern Italy, province of Genoa, and 56 m. s.e. of the city of that name. Pop. '81, 19,864. It is situated near the inner point of the gulf of Spezia. The

gulf is formed by the bifurcation of a spur of the Apennines, and is $3\frac{1}{2}$ m. long, and 3 m. broad; its western shore is indented by many coves or creeks, five of which—Porto-Venere, La Castagna, the Varignano (the Quarantine station), Grazie, and Panigaglia—are so deep that large men-of-war may be moored in them. The emperor Napoleon I. recognized the importance of this gulf, and at one time designed, it is said, to make it the chief naval station of his empire in the Mediterranean. The Italian government has made it the station for its ships of war, and it is now the chief arsenal of the kingdom. Its shipping and commerce are considerable, and the construction of a commercial harbor, to the east of the town, was begun in 1890. The scenery of the gulf is very beautiful, and the mildness of its climate was famous in ancient times, when it was known as the gulf of Luna. The soil produces olives, excellent wines, fruits, etc., and the town has become within recent years a much-frequented health resort in winter. There are numerous foreign consulates. The railway from Genoa to Spezia was completed in 1873.

SPEZZIA (the ancient *Tiparenos*), a small Greek island at the entrance to the Gulf of Nauplia. The island is unfruitful, and its people are engaged chiefly in commercial pursuits. The population in 1889 was 5192, of whom 5172 lived in the town of Spezia, on the n. coast of the island.

SPHERULARIA, a very remarkable nematode, or round worm, which exists as a parasite in various species of bees. The female is almost an inch in length, has a nearly uniform diameter of $\frac{1}{8}$ of an in. is, of a whitish color, is bluntly pointed at each end, and is covered with numerous (about 800) small button-like projections—a peculiarity to which it owes its name. There is neither mouth, esophagus, intestine, nor anus, and the whole animal consists of little more than an elongated mass of fatty tissue and reproductive organs, which in full-grown individuals contain ova in various stages of development. Although the female was discovered in 1836 (by Leon Dufour), it was not until Jan. 1861 that the discovery of the male was announced by Mr. Lubbock in his memoir on this parasite in *The Natural History Review*. The male is more than 28,000 times smaller than the female, which accounts for its having been previously overlooked. It is frequently found sexually united to the female in the same manner as occurs in *sclerostoma syngamus* (q. v.), the parasite which gives rise to the *gapes* in various birds.

SPHAGNUM, a genus of moss, whose spore-case is an urn closed by a deciduous lid, and its brim toothless, the calyptra irregularly torn. Several species are natives of Britain, and are common in bogs, from which they derive their popular name, Bog Moss. They are remarkable for the whitish color of their leaves. They are very elegant plants. They often grow in considerable masses, absorbing water like a sponge, but becoming friable when dry. They contribute much to the formation of peat. Gardeners employ them in preference to other mosses for covering the roots of plants and keeping them moist, as they have in a high degree the property of absorbing moisture from the atmosphere. They have been used as food in barbarous countries, but are very slightly nutritive. The cells of the leaves are remarkable for their spiral structure, and for large pores in their sides. See illus., *MOSSSES*, vol. X.

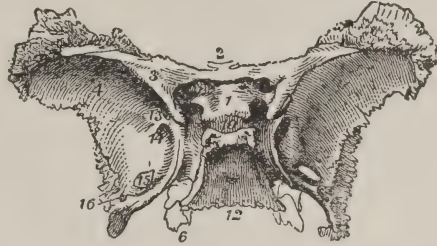
SPHEGIDÆ, or **SPHECIDÆ**, a family of hymenopterous insects, winged in both sexes, and much resembling bees or wasps in general appearance. They are solitary in their habits. Many of them burrow in sand, and are known as *sand-wasps*. They are extremely active and restless, and may be seen running about on sand-hills, with their wings in constant motion. Some of them carry spiders, and others caterpillars, into their burrows, as food for their larvæ, placing them there when the egg is laid, and stinging them so as to render them torpid, without killing them. They display wonderful energy and perseverance in dragging the spider or caterpillar to the burrow. They are mostly tropical insects. See illus., *BUTTERFLIES, ETC.*, vol. III.

SPHENISCIDÆ, the penguin family, or a sub-family of *brevipennatæ*, belonging to the order *natatores*, or swimmers. The principal or typical genus is *spheniscus*. The penguins occupy in the southern hemisphere the place filled by the auks in the northern. See *AUK*. They live gregariously in the seas of the southern hemisphere on the coasts of south Africa and South America, especially at Terra del Fuego, and on the solitary islands of the South Pacific. The *spheniscidæ* contain the genera *spheniscus*, *eudyptes*, *pygoscelis*, and *apterodytes*. The *apterodytes patagonica*, or the king penguin, is the most remarkable. Mr. G. Bennett, who saw them at Macquarrie island in the southern Pacific (see *PENGUIN*), says: "They are arranged when on shore in as compact a manner and in regular ranks as a regiment of soldiers; and are classed with the greatest order, the young birds being in one situation, the molting birds in another, the sitting hens in a third, the clean birds in a fourth, etc.; and so strictly do birds in similar condition congregate that, should a bird that is molting intrude itself among those which are clean, it is immediately ejected from them. The females hatch the eggs by keeping them close between their thighs; and if approached during the time of incubation, move away, carrying their eggs with them. At this time the male bird goes to sea and collects food for the female, which becomes very fat. After the young is hatched both parents go to sea and bring home food for it. It soon becomes so fat as scarcely to be able to walk, the old birds getting very thin." Capt. Fitzroy gives the

following account of the manner of feeding the young of the jackass penguin, *spheniscus demersus*, at Noir island: "The old bird gets on a little eminence and makes a great noise (between quacking and braying), holding its head up in the air as if it were haranguing the penguinery, while the young one stands close to it, but a little lower. The old bird, having continued its clatter for about a minute, puts its head down and opens its mouth widely, into which the young one thrusts its head, and then appears to suck from the throat of its mother for a minute or two, after which the clatter is repeated, and the young one is again fed; this continues for about ten minutes." Mr. Darwin relates an encounter with one of these birds on the Falkland islands: "I was much amused by watching its habits. It was a brave bird; and until reaching the sea it regularly fought and drove me backward. Nothing less than heavy blows would have stopped him; every inch gained he firmly kept standing close before me, erect and determined. When thus opposed he continually rolled his head from side to side, in a very odd manner, as if the power of vision only lay in the anterior and basal part of each eye."

SPHENOID BONE (Gr. *sphên*, a wedge, and *eidos*, form) is situated at the anterior part of

the base of the skull, and articulated with all the other cranial bones, which it wedges firmly together. It somewhat resembles a bat with its wings extended, and hence was termed the *os vesperilionis*. It is divisible into a body, the greater and lesser wings, and various processes. The greater wings present three surfaces: a superior or cerebral surface, forming part of the floor on which the brain rests; an anterior surface, which assists to form the outer part of the orbit of the eye, and an external surface with a rough ridge, giving attachment to the external pterygoid muscle, one of the most powerful muscles of mastication. The second, third, fourth, fifth, and sixth cranial nerves emerge from the cranial cavity through foramina in this bone. Although considered in human anatomy as a single bone, it may be regarded as composed of several bones, which, after a time, unite with one another, as the basi-sphenoid, the pre-sphenoid, the ali-sphenoid, and the orbito-sphenoid bones.



The upper or cerebral of the sphenoid bone:

1. The olivary process; 2, the ethmoidal spore; 3 and 4, the lesser and greater wings on the left side; 6, the extremity of left pterygoid process; 7, the foramen for the optic nerve; 10, the sella turcica on which the pituitary gland rests; 12, the basilar portion of the bone, joining with the occipital; 13, part of the sphenoidal fissure which separates the greater from the lesser wings, and transmits the 3d, 4th, the ophthalmic division of the 5th, and the 6th nerves, with the ophthalmic vein; 14, the foramen rotundum, transmitting the second division of the 5th nerve; 15, the foramen ovula, transmitting the third division of the 5th nerve; 16, the foramen sponosum for the passage of the middle meningeal artery.

SPHERE, a regular solid figure, every point of whose surface is equally distant from its center; and whose outline is traced by a circle revolving round its diameter. All sections of a sphere by a plane are necessarily circles, and all sections by planes passing through the center, or by planes cutting the sphere at equal distances from the center, are equal. The former sections are called *great*, and the latter *small, circles*. Small circles may vary in size between a mere point and a great circle, approaching either limit as nearly as we please. The surface of a sphere is equal to that of four of its great circles, or (taking x for the radius of the sphere) to $4\pi x^2$; and its volume to that of a cone whose altitude is twice that of the sphere, or $4x$, and whose base is a great circle of the sphere, the formula for it being $\frac{4x}{3} \times \pi x^2$, or $\frac{4}{3}\pi x^3$. The most remarkable geometrical

property of the sphere is the relation which its surface and volume bear to those of the "circumscribing" cylinder, i.e., a cylinder whose length and diameter of each end are each equal to the diameter of the sphere, and in which, therefore, the sphere will be exactly contained. The concave surface of such a cylinder is exactly equal to the surface of the sphere; and not only so, but if a section parallel to the base of the cylinder be made through both cylinder and sphere, the curved surfaces of the portions cut off are equal, whether such portion be cut off from one end or be intercepted between two parallel sections; it follows from this that the curved surface of any section of a sphere with parallel ends is equal to the product of the circumference of a great circle of the sphere by the height or thickness of the section, and that the curved surfaces of all sections of a sphere are proportional to the thickness of such sections. The volume of the sphere, also, is equal to two-thirds of that of the circumscribing cylinder.

SPHEROGRAPH, a simple and exceedingly efficient instrument for the mechanical solution of such problems in spherical trigonometry as navigation, geography, etc., present, was invented in 1856 by Mr. Stephen Martin Saxby, R.N. It consists of two circular pieces of paper, the whole of the under and the rim of the upper being made of stout card-board, and the interior portion of the upper one of strong transparent tracing-paper; these two circles are attached by a pin through their common center, the pin being made to work in an ivory collar, so as to prevent any lateral motion of either circle. Round the pin as center, equal circles are drawn, one on each sheet; each circle

is then filled in with lines representing meridians and parallels according to the stereographic projection, and the instrument is completed. As one of the chief uses of the spherograph is to show the course, distance, and differences of latitude and longitude in "great circle sailing" (q.v.), we shall give a problem of this sort in illustration of the

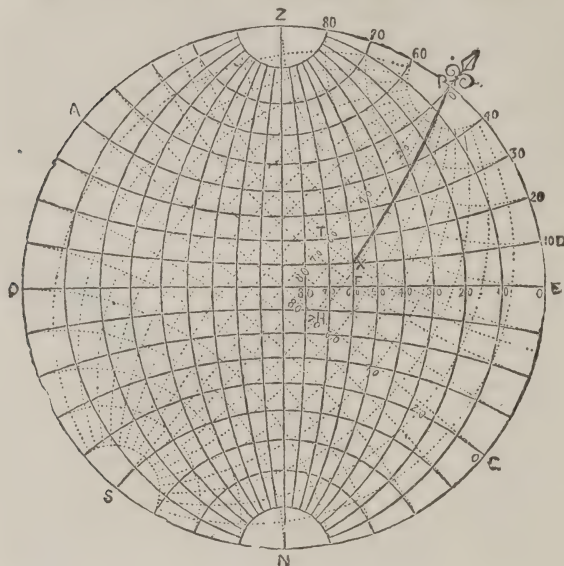


FIG. 1.

X represents the point to be arrived at, and consequently PX, the arc of a great circle passing through P and X, is the great circle track, PD is the difference of latitude, EF the difference of longitude; the spherical angle XPD, measured by GH, an arc of a great circle, of which P is the pole, is the course; and the length of PX is measured by PT, the portion of PS which is cut off by a parallel of the under circle through X, in degrees. The data, then, being as above, we find by inspection of the instrument the difference of lat. = 40° s., the difference of long. = 60° w., the course = $s. 72\frac{1}{2}^{\circ}$ w., and the distance = $63\frac{1}{2} = 3,800$ nautical miles. Besides the saving of time and labor by the use of this instrument—the whole work being the *setting* of the instrument, and then the reading off of the required elements—it is evident that the substitution of a mechanical solution for calculation greatly lessens the probability of error. It is found that spherographs of 5 in. radius give results of sufficient accuracy for all the purposes of the navigator.

All other spherical problems can be solved with equal facility by this instrument, but one more example will suffice. Let Z (fig. 2) now represent the zenith of a place, ZHNR its meridian, P the north pole of the heavens; the other lines are then circles of declination, altitude, azimuth, and hour circles; and let O represent the place of the sun in given declination and altitude at a certain time. The instrument is now set by turning round the upper card till the point O (determined by its circle of declination and hour circle) on the under card falls upon the circle of given altitude on the upper card, then d is the sun's place at noon, Hd being his meridian altitude, PR the latitude of the place, the angle RPS (measured in degrees along QE) the time of sunset, ds half the length of the day, so half the length of the night, etc. The spherograph is also useful in finding latitude when the horizon is hid by fogs, right ascensions at night, and in correcting lunar observations; but for these purposes, spherographs are specially constructed, as some slight variations in the form given above are necessary.

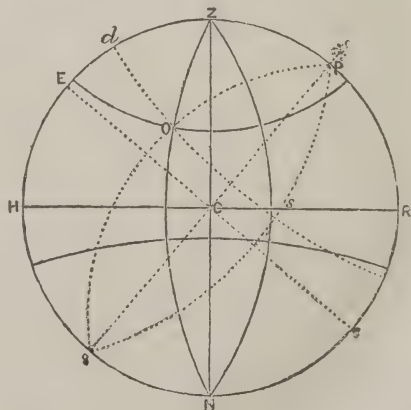


FIG. 2.

SPHEROID is a species of ellipsoid (q.v.), and is represented by the same equation. If an ellipse be made to revolve round one of its axes, the curved outline of the ellipse describes the spheroid. Should the major or longer axis be the axis of revolution, the spheroid is said to be *prolate* (Lat. *prolatus*, lengthened), but if the minor or shorter axis, *oblate*. The earth's axis of revolution, which runs from pole to pole, being about 25 m. shorter than the longest or equatorial diameter, and these being at right angles to each other, the earth is considered as an oblate spheroid.

SPHEROIDAL CONDITION of liquids is the name usually given to a series of very singular phenomena discovered by Leidenfrost, but first carefully investigated by Bontigny. Indeed, one, at least, of these phenomena has been popularly known for a very long time, being the foundation of the rough practical method of determining whether or not a flat-iron is so hot as to be likely to singe the linen to which it is to be applied. The test consists simply in letting a drop of water fall upon the iron; if it be not too hot, the drop spreads over the surface and evaporates. If it be too hot, the drop at once glances off the iron without wetting it.

The common experimental method of exhibiting the spheroidal condition is easily performed thus: A metallic disk, slightly concave, like a watch-case, is heated by a lamp, and water is cautiously dropped on it from a pipette. If this be done before the disk is sufficiently heated, the water boils almost explosively, and is dispersed at once in vapor. But when the disk is hot enough, the water remains suspended *above* the surface; and the drop, when small, takes nearly the form of an oblate spheroid. Various proofs have been given, though they are obviously unnecessary, that there is no contact in this case. Thus, if the disk be very nearly flat, light passes freely between it and the drop. Again, if one pole of a galvanic battery be connected with the disk, and the other be dipped into the drop, a galvanometer interposed in the circuit shows that no current passes. By heating the disk sufficiently, and dropping on the water very carefully, we may easily keep in the spheroidal state as much water as, if not more than, it could hold when cold. The explanation of the phenomenon is not yet quite clear; but there is no doubt that the radiant heat from the disk raises vapor so freely from the surface of the drop nearest it, as to interpose a cushion of dense and highly heated vapor between them, on which the drop, as it were, floats; the pressure of the vapor balancing its weight. This is not, however, a quite complete explanation of the experiment, and it would require too much detail to examine it more closely. But the most curious fact connected with the experiment is, that the water does *not* boil. In fact, it evaporates so freely that the heat carried off from it, as latent heat, by the vapor which is constantly formed, keeps its temperature somewhere about 206° F. only. This suggests a curious experiment, which is found to succeed. *Boiling* water, dropped on a red-hot plate of metal, instantly assumes the spheroidal state, and is *cooled* six degrees below boiling.

It is not necessary that a metal plate be used—a watch-glass will suffice for the experiment; but *hot* water must be dropped on it, else the glass will crack.

Other liquids, and even some bodies which are solid at ordinary temperatures, can be easily brought into the spheroidal state—the lowest requisite temperature of the disk being dependent on the boiling point of the substance. Thus, while water has a temperature of 206° F. in the spheroidal state, the disk must have a temperature of 340° F. at least. For alcohol, these temperatures are 168° F. and 270° F.; for ether, 94° F. and 140° F. A good example of a solid entering this state is furnished by dropping crystals of iodine on a hot platinum disk.

It is not necessary that the disk should be solid; it is easy to obtain ether, and even water, in the spheroidal state over the surface of hot oil—but great care is required, as explosions are apt to occur, in which case the hot oil is freely thrown about.

Many cases of bursting of steam-boilers, otherwise apparently inexplicable, seem to be attributable to this condition of matter. Thus, if we suppose that the water-supply has run low, and the boiler has been overheated, it is conceivable that the contents may sometimes be in the spheroidal state. The addition of cold water in such a case would bring them suddenly *in contact* with the overheated metal, and large quantities of steam would be generated with violence.

A very singular experiment, the freezing of water on a red-hot plate, is easily performed by the help of this property of matter. Liquid sulphurous acid is so volatile as to have a temperature of 13° Fahr. only, when in the spheroidal condition. As this is 19° under the freezing-point of water, if a little water be dropped into the spheroid of acid, it is at once frozen, and the pellet of ice can be dropped on the hand from the still red-hot plate.

Even mercury can be frozen by a similar process, but as much greater cold is required, the substance in the spheroidal state is a mixture of solid carbonic acid and ether.

The hand may be dipped for a short time with impunity into melted lead, and even into melted copper. The vapor, instantly raised from the moisture of the skin, prevents, so long as that moisture lasts, more than an endurable amount of radiant heat from reaching the hand, and also prevents direct contact. It is probable that a knowledge of some forms of this phenomenon, in old days, was employed by priestcraft for the purpose of protecting, when it was desirable to do so, the victims of the ordeal (q.v.) by fire.

The phenomenon may easily be reversed. Thus, a red-hot silver ball, dropped into a vessel of water, is seen to glow for some time, till it has so far cooled that the water comes into contact with it, when we have, as in the other form of the experiment, an immediate and violent formation of vapor. The success of this experiment is greatly aided by the addition of some strong ammonia to the water.

SPHINCTER MUSCLES (Gr. *sphinktēr*, that which binds tight) are circular bands of muscular fibers, whose function is to antagonize the expellent action of certain viscera, especially the bladder and the lower part of the intestinal canal. It is to the presence of these muscles that the higher animals owe the power of retaining for a considerable period the excrementitious matters collected in the bladder and rectum, and of discharging them at intervals, the sphincter muscles, being like those engaged in the process of respiration, mainly, but not entirely, under the control of the will. Under certain conditions, however, the necessity for expelling the contents of these viscera becomes so urgent that the sphincters lose their ordinary voluntary power.

SPHINX, a Greek word, signifying the squeezer or strangler, applied to certain symbolical forms of Egyptian origin, having the body of a lion, a human or an animal head, and two wings attached to the sides. Various other combinations of animal forms have been called by this name, although they are rather griffins or chimeras. Human-headed sphinxes have been called androsphinxes; one with the head of a ram, a criosphinx; with a hawk's head, a hieracosphinx. The form, when complete, had wings added at the sides; but these are of a later period, and seem to have originated with the Babylonians or Assyrians. In the Egyptian hieroglyphs, the sphinx bears the name of *Neb*, or lord, and *Akar*, or intelligence, corresponding to the account of Clemens, that these emblematic figures depicted intellect and force. The idea that they allegorized the overflow of the Nile when the sun was in the constellations Leo and Virgo appears quite unfounded. In Egypt the sphinx also appears as the symbolical form of the monarch considered as a conqueror, the head of the reigning king being placed upon a lion's body, the face bearded, and the usual dress-drapery being suspended before it. Thus used, the sphinx was generally male; but in the case of female rulers, the figure has a female head and the body of a lioness.

The most remarkable sphinx is the Great Sphinx at Gizeh, a colossal form, hewn out of the natural rock, and lying 300 ft. e. of the second pyramid. It is sculptured out of a spur of the rock itself, to which masonry has been added in certain places, to complete the form, and measures 172 ft. 6 in. long by 56 ft. high. Immediately in front of the breast, Caviglia found, in 1816, a small naos, or chapel, formed of three hieroglyphical tablets, dedicated by the monarchs Thothmes III. and Ramesses II. to the sphinx, whom they adore under the name of Heremakhu, or Harmachis, as the Greek inscriptions found at the same place call it—i.e., the sun on the horizon. These tablets formed three walls of the chapel; the fourth, in front, had a door in the center, and two couchant lions placed upon it. A small lion was found on the pavement, and an altar between its fore-paws, apparently for sacrifices offered to it in the time of the Romans. Before the altar was a paved esplanade or dromos, leading to a staircase of thirty steps placed between two walls, and repaired in the reigns of M. Aurelius and L. Verus, May 10, 166 A.D. In the reign of Severus and his sons, 199–200 A.D., another dromos in the same line as the first, and a diverging staircase, were made, while some additions were found to have been made to the parts between the two staircases in the reign of Nero. Votive inscriptions of the Roman period, some as late as the 3d c., were discovered in the walls and constructions. On the second digit of the left claw of the sphinx, an inscription, in pentameter Greek verses, by Arrian, probably of the time of Severus, was discovered. Another metrical and prosaic inscription was also found. In addition to these walls of unburnt brick, galleries and shafts were found in the rear of the sphinx, extending northward. The excavations, however, of M. Mariette, in 1852, have thrown further light on the sphinx, discovering the peribolos, or outer wall that encircled it; that the head only was sculptured, and that the sand which had accumulated round it was brought by the hands of man, and not an encroachment of the desert; also that the masonry of the belly was supported by a kind of abutment. To the s. of the sphinx, Mariette found a dromos, which led to a temple built at the time of the 4th dynasty, of huge blocks of alabaster and red granite. In the midst of the great chamber of this temple were found seven statues, five mutilated and two entire, of the monarch Shaf-ra or Cephren, made of a porphyritic granite. They are fine examples of ancient Egyptian art. While the beauty and grandeur of the Great Sphinx have often attracted the admiration of travelers, its age has always remained a subject of doubt, but these later discoveries prove it to have been a monument of the age of the 4th dynasty, or contemporary with the pyramids. See *illus., Egypt, vol. V., p. 294, fig. 2.*

Besides the great Sphinx, avenues of Sphinxes have been discovered at Saqqarah, forming a dromos to the Serapeum of Memphis, and another dromos of the same at the Wady Esseboua. A Sphinx of the age of the shepherd dynasty has been found at Tannus, and another of the same age is in the Louvre; and a granite Sphinx, found behind the vocal Memnon, and inscribed with the name of Amenophis III., is at St. Petersburg. An avenue of criosphinxes has been found at Karnak. These are each about 17 ft. long,

and of the age of Horus, one of the last monarchs of the 18th dynasty. Various small Sphinxes are in the different collections of Europe, but none of any very great antiquity.

The Theban Sphinx, whose myth first appears in Hesiod, is described as having a lion's body, female head, bird's wings, and serpent's tail, ideas probably derived from Phenician sources, which had adopted this symbolical form into the mythology from Egypt. She was said to be the issue of Orthos, the two-headed dog of Geryon, by Chimæra, or of Typhon and Echidna, and was sent into the vicinity of Thebes by Juno, to punish the transgression of Laius, or, according to other accounts, by Bacchus, Mars, or Pluto. See *ŒDIPUS*. The Sphinx was a favorite subject of ancient art, and appears in bas-reliefs, on medals of Chios and other towns, and often as the decorations of arms and furniture. In Assyria and Babylonia, representations of Sphinxes have been found, and the same are not uncommon on Phenician works of art.

Birch, *Mus. of Classic Antiquit.*, ii. p. 27; *Quart. Rev.* xix. p. 412; Vyse, *Pyramids*, iii. p. 107; Young, *Hieroglyphicks*, Pl. 80; Letronne, *Inscr.*, *Grecq.* ii. p. 460; *Rev. Arch.*, 1853, p. 715; 1860, p. 20; *Schol. Euripid.*, i. 1, 1134; Hesiod, *Theog.*, 326; Creuzer, *Symbolik*, i. 495; Millin, *Gal. Myth.*, 502, 505.

SPHINX. See *HAWK-MOTH*.

SPHYGMOGRAPH, an instrument by which we ascertain, and permanently record, the form, force, and frequency of the pulse-beat, and the changes which that beat undergoes in certain morbid states. This instrument consists of two essential parts: (1) Of two levers, one of which is so delicately adjusted on the vessel the pulsation of which it is desired to examine, that on each expansion of the vessel the lever undergoes a corresponding slight elevation: this lever communicates by a perpendicular arm with a second, to which it transmits the impulse received from the vessel; the extremity of this second lever is armed with a pen-point, which records the movements thus indicated on a movable plate, controlled by the second part of the instrument. (2) The second portion consists of a plate, moved by watch-work, and bearing a strip of paper on which the *sphygmographic* tracery is formed.

Mode in which the Tracery is formed.—As the pulse transmits through the levers a vertical movement to the pen-point, and the plate, on which the tracery is formed, is moved steadily across the pen-point, an undulating line is the result: the *height* of the elevations indicating the strength of the pulse; and the *number* of the elevations delineated in the time the pen takes to travel its frequency. The tracings produced by the pulse at the wrist in forms of cardiac disease exhibit the manner in which the tracing is modified in diseased states of the circulatory system. In the case of a patient suffering from an incompetent state of the valves guarding the orifice of the aorta, the great vessel conveying blood from the heart, the blood, when propelled into the aorta, distends it, and communicates a pulse throughout the arterial system. When the vessel again contracts, regurgitation takes place into the cavity of the heart, as the valves, which should prevent this regurgitation, and maintain the arterial tension, are unable to perform their function. The pulse-beat is accordingly abrupt, and of short duration, and the sphygmographic tracing presents a series of abrupt elevations and depressions. In a different form of cardiac disease, in which the valves are so affected as to obstruct the passage of the blood into the circulation, the effect on the pulse is to render its beats weakly marked and irregular; and in the sphygmographic tracing, the elevations are diminished in height and regularity. The pulse, in extreme forms of this lesion, is represented in sphygmographic tracing by a slightly waving line.

SPHYRÆNIDÆ, a family of fishes included by Cuvier in *Percidæ*, but having the ventral fins far behind the pectorals, and the bones of the pelvis quite detached from those of the shoulder. The form is elongated; there are two dorsal fins; the scales are small and cycloid; the mouth very large, with strong sharp teeth. The species are found in the Mediterranean and in tropical seas. Some attain a large size, as the *BARRACOUA*, or *Barracouda Pike* (*Sphyræna barracouda*), an inhabitant of the tropical parts of the Atlantic ocean, which is scarcely less formidable than the white shark. It is, however, held in considerable estimation as an article of food, but at some seasons of the year becomes unwholesome. It is a beautiful fish, of a rich green color above, and white beneath. The *BECCUNA* (*S. vulgaris*) is also valued as an article of food, and its scales and air-bladder yield a substance used for making artificial pearls.

SPICCA' TO (Ital. separated), a musical term, indicative, like *Staccato* (q. v.), of a distinct and detached mode of performance. Its usual application is to music for bowed instruments, where it implies that each note is to have a bow distinct from that which precedes or follows it.

SPICE ISLANDS. See *MOLUCCAS*.

SPICES (Lat. *species*, kinds; in later Latin, kinds of goods, or produce in general; and then, the most highly prized kind of goods, the aromatic productions of the east), aromatic and pungent vegetable substances, used as condiments and for flavoring food. They are almost exclusively the productions of tropical countries. In ancient times, and throughout the middle ages, all the spices known in Europe were brought from the east; and Arabia was regarded as the land of spices, but rather because they came

through it, or were brought by its merchants, than because they were produced in it, for they were really derived from the further east. They owe their aroma and pungency chiefly to essential oils which they contain. They are yielded by different parts of plants; some, as pepper, cayenne pepper, pimento, nutmeg, mace, and vanilla being the fruit or particular parts of the fruit; while some, as ginger, are the root-stock; and others, as cinnamon and cassia, are the bark. Tropical America produces some of the spices, being the native region of cayenne pepper, pimento, and vanilla; but the greater number are from the East Indies.

SPIDER, *Aranea*, a Linnaean genus, now divided not only into many genera, but into many families, and constituting a section (*araneida*) of the class *arachnida*, and order *pulmonaria*. The species are very numerous, and are found in all parts of the world, but most abundantly in tropical countries, which also produce the largest species, some of them capable of making very small birds, and not merely insects, their prey (see BIRD-CATCHING SPIDER). The *cephalothorax*, formed by the combination of the head and thorax into one piece, is covered with a kind of horny buckler, generally of an oval form; the abdomen is attached to it by a short stalk, and is generally soft and tumid. Each of the eight legs consists of seven joints, the last armed with two hooks, which are commonly toothed like a comb. The *frontal claws*, commonly called *mandibles*—which do not, however, correspond to the mandibles of insects, and move in an entirely different direction, up and down—are terminated by a sharp movable hook, which has near its extremity a small slit for the emission of a venomous fluid secreted in a gland of the previous joint. The *maxillæ* are two in number, and between them is an organ called the *tongue*, forming part of the external apparatus of the mouth. The *maxillæ* are the basal joints of the *pulpi*, which resemble very small legs, and are often terminated in the females by a small hook, but in the males by complicated and curious appendages, characteristic of the different genera and species. Spiders have generally eight eyes, the relative position of which varies remarkably in the different families and genera. A few species have only six eyes, and a very small number have only two. The upper surface of the abdomen generally exhibits a number of impressed spots, most conspicuous in those kinds which have a smooth naked skin. The pulmonary orifices are either two or four in number, and are situated near the base of the abdomen. Near the anus are several *spinnerets*, small protuberances, pierced at the extremity with a multitude of minute orifices, from which threads of extreme tenuity are produced, all these threads combining to form one thread of the *web*. The substance which exudes from the spinnerets is glutinous, and immediately dries into thread on coming in contact with the air. It is elaborated in reservoirs, which terminate in intestine-like tubes. All spiders have spinnerets, and produce threads, although all do not use them for the same purposes; for they differ very much in their habits: some employ their webs in order to catch their insect prey, while others depend for the capture of their prey on their powers of running and leaping; and some weave for themselves habitations in which they live, while others select holes and crevices as their places of abode. Almost all spiders envelop their eggs in silken cocoons, which some of them tear open when the young are hatched; they are attentive to their young, some carrying them for a time on their back, while some carry the cocoons or egg-cases beneath their breast, and others carry them attached to the extremity of the abdomen. Nearly 2,000 eggs have been found in a single cocoon, and the young, when set free, may be seen swarming over the body of the mother, so as almost to conceal her from view. The female spider is, in many of the species, much larger than the male, and a very remarkable danger attends the amatory approaches of the latter, as, if they are not favorably received, he is not uncommonly killed and eaten on the spot. Spiders are very pugnacious, and in their combats often sustain the loss of limbs; but, like crustaceans, they possess the power of repairing this loss. Like them also, they change their skin frequently during their growth; but they undergo no proper transformation. There is much similarity of form among all the multitude of kinds. Many of them exhibit very brilliant and beautiful colors, among which are some of the American species, to be found in fields and moors, although the common house spider (*aranea domestica*) is of very unattractive appearance.

All spiders kill the insects and other small creatures on which they prey by means of their venomous mandibles, and the bite of a house spider is quickly fatal to a house-fly. The bite of the larger species is dreaded even by man, being very painful, and not only producing much inflammation and swelling, but often much fever. Death has been known to ensue.

Spiders' webs have long been in high repute for stanching wounds. Threads of this material are also employed for the cross-wires of astronomical telescopes. Textile fabrics have been made of it, but only as articles of curiosity.

Spiders have been arranged by Walcknaer in five principal groups, distinguished by their habits. (1.) *Hunting spiders*, which incessantly run about in the vicinity of their abode in quest of prey, some of them weaving silken tubes, in which they dwell, others hiding in fissures; some remarkable for the swiftness with which they run, others for their power of leaping in order to seize their prey. Some of them are of large size. Livingstone mentions a South African one which can leap a distance of one foot. A small one is common on windows in Britain in summer, and, when leaping, avoids the

danger of falling from the window by suspending itself at the same moment by a thread. (2.) *Wandering spiders*, which have no fixed residence, have the power of running sideways or backwards, and throw out threads to entrap prey, but do not weave them into regular webs. Some of them live among plants, and place their egg-cases on leaves, the edges of which they bind together with their silk. (3.) *Prowling spiders*, which have nests, but prowl about in their neighborhood, or in that of the threads which they spread to catch prey. (4.) *Sedentary spiders*, such as the common house spider, which spin large webs, and lie in wait at the middle or at the side. These are subdivided according to the fashion and structure of their webs. (5.) *Water spiders*, which resemble the last group in their habits, except that they live in water, generally among the stems and leaves of aquatic plants, where they construct their webs. A very interesting species, one of the most interesting possible inmates of an aquarium, is the common water spider (*argyroneta aquatica*) of Britain, not unfrequently to be found in deep ditches and ponds in some parts of England. It is of a brownish color, densely covered with hairs, which are of great importance in its economy, entangling air, which the animal carries down with it into the water, to supply its pulmonary sacs; for the water spiders all breathe by the same kind of organs as their terrestrial congeners. The eggs of the water spider are attached to the leaves or stems of plants under the surface of the water, and are protected by a dome-shaped web, so close in its structure as to retain the air which is brought into it, and in which the spider itself lives, bringing down air on its furred body till the dome is filled. The entrance is from below.—The most curious nests are those of the trap-door spiders, belonging to the group *territelariæ*, or underground weavers. The nest is a tubular burrow, lined with silk, and having the entrance covered with a circular lid of the same material attached to the edge of the lining by a kind of hinge. In the most common form of nest, the lid is made thick by having layers of earth between the layers of silk, and fits like a cork into the mouth of the tube, which is beveled to receive it. As mosses grow on the lid as well as on the surrounding ground, the concealment is complete. In some types of nest, there is a thin external door, and then one of a more solid kind some inches below, behind which the inmate can place itself, and resist the intrusion of an enemy. In one kind of these double-door nests, a side gallery branches off from the main one, and the external door is so placed at the angle that it can be made to shut either.

SPIDER-FLY, *Ornithomyia*, a genus of dipterous insects, closely allied to the forest fly (q.v.), but the claws of the tarsi having three instead of two teeth; and the species are parasitical on birds, never on quadrupeds. *O. avicularia* frequently infests the common fowl, the blackcock, and other birds in Britain. It is greenish yellow, with smoke-colored wings.

SPIDER-MONKEY, a name often given to species of the genus *ateles*, small American monkeys, on account of their very long, slender, inelegant limbs. The tail is very long, and not only prehensile in the highest degree, but endowed with a wondrous sensitiveness of touch. These monkeys display great intelligence. It is their common practice to break nuts by means of stones; and a tame one which Dr. Gardner carried with him in his travels in Brazil, used to try a larger stone, if the first did not serve its purpose, and even to take it up in both paws, and dash it upon the nut, jumping quickly out of the way to avoid injury to its own toes. This animal generally rode on the back of a large mastiff, and in descending a steep hill, would curl its tail round the root of the mastiff's tail, to make its seat secure.

SPIEGELEISEN. See BESSEMER PROCESS; also KRUPP'S STEEL.

SPIELHAGEN, FRIEDRICH, b. Magdeburg, 1829; studied philology and philosophy at Berlin, Bonn, and Greifswald; then devoted himself to literature. He wrote *Clara Vere* (1857); *Auf der Düne* (1858); *Problematische Naturen* (1860); *Durch Nacht zum Licht* (1861); *Die von Hohenstein* (1863); *Unter Tannen* (1867); *Was die Schwalbe sang* (1872); *Quisisana* (1879); and *Uhlenhans* (1884). A collection of his novels was issued in 1895 in 22 vols. His autobiography appeared in 1890.

SPIGE'LIA, a genus of plants of the natural order *loganiaceæ*, having a calyx glandular inside, a long slender valvate, corolla, long filaments, and a capsule of two *cocci*, splitting around at the base.—*S. maritandica*, often called WORM GRASS and CAROLINA PINK, is a native of the southern United States, a perennial plant with a simple quadrangular stem. The root (PINK ROOT) is purgative, narcotic, and poisonous, but is a powerful vermifuge, and is very commonly employed in the United States.—*S. anthelmica*, an annual native of tropical America with very small purplish flowers, in spike-like racemes, possesses similar properties. The efficacy of both is, however, impaired by keeping; and they are apt to produce unpleasant symptoms when used as medicines. Other species are also known as poisons.

SPIKE, in botany, that kind of inflorescence in which sessile flowers, or flowers having very short stalks, are arranged around an axis, as in the greater plantain, common vervain, common lavender, and some species of sedge. In rye, wheat, barley, darnel, and many other grasses, there is a sort of compound spike, that is, the flowers or fruits are arranged together in spikelets, upon short stalks, which again surround the top of the

culm in the form of a spike. The catkin, the spadix, and the cone may be regarded as varieties of the spike.

SPIKENARD, or **NARD** (Gr. *Nardos*), a perfume highly prized by the ancients, and used both in baths and at feasts. It was brought from India, and was very costly. The "ointment of spikenard" (John xii. 3) was probably an oil or fat, impregnated with the perfume. The plant which produces it has been ascertained by the researches of sir William Jones and Dr. Royle to be the *nardostachys jatamansi*, the jatamansi of the Hindus, a small plant of the natural order *valerianaceæ*, a native of the mountains of the n. of India, and found at least as far s. as the Deccan. It grows on the Himalaya to an elevation of 18,000 ft. and its roots are a favorite perfume in Tibet and Nepal. The ladies of Nepal use oil in which the root has been steeped for perfuming their hair. The odor is not, however, generally agreeable to Europeans. The root, which is from 3 to 12 in. long, sends up many stems, with little spikes of purple flowers, which have four stamens.—The name spikenard was given by the ancients to perfumes used as substitutes for the true or Indian spikenard, some of which were derived from the roots of plants of the same natural order, kind called Gallic or Celtic spikenard from those of *valeriana Celtica* and *V. saluinea*, which are still used in the east for perfuming baths; and that called Cretan spikenard from those of *V. Italica*, *V. tuberosa*, and *V. phu*. All of these grow on the Alps and other mountains of the s. of Europe, and the peasantry of Styria and Carinthia collect them from rocks on the borders of perpetual snow. They are tied in bundles, and sold at a very low price to merchants, who sell them at a great profit in Turkey and Egypt, from which they are partly transmitted even to India. About sixty tons are annually exported from Trieste.

SPIKING is the operation of rendering a cannon useless without the expenditure of much time and labor. It is resorted to by troops compelled to abandon their own ordnance, or unable to remove pieces of the enemy's which they have captured. The process consists in driving a nail or spike into the vent or touch-hole. To remove it, it is recommended, if an iron gun, to load with double charge and double balls, and to fire by a train laid through the muzzle. This is supposed to loosen the spike. If the gun be of brass, a few drops of sulphuric or nitric acid on the touch-hole will render it practicable to extract the spike. If these methods fail, nothing remains but the tedious process of drilling out the spike or boring a new vent.

SPI NA BI FIDA is a congenital malformation, occurring perhaps more frequently than any other except hare-lip, and arising, like it, from arrest of development. It may be regarded as a congenital hernia of the membranes of the spinal cord, through a fissure in the wall of the bony canal. A tumor is thus formed, which is usually of a roundish shape, varying in size from that of an egg to that of an adult head, lying in the middle line of the back, fluctuating, and adhering to the adjacent vertebræ either directly or by a pedicle. The usual termination of the disease is death. As the size of the tumor increases, fatal convulsions ensue; or the skin investing the tumor may ulcerate, and the contents escape, in which case palsy or convulsions produce death. Occasional cases are, however, recorded in which patients with this affection have survived till middle life. Active surgical treatment usually hastens death, and should only be resorted to in the most urgent circumstances. Moderate support by means of a hollow truss, or a well-padded concave shield, may tend to keep the disease stationary; and any interference beyond this, is in the great majority of cases, unadvisable.

SPINACH, or **SPINAGE** (*Spinacia*), a genus of herbaceous plants, of the natural order *chenopodiaceæ*; dioecious, the male flowers consisting of a 4-parted perianth and four stamens; the female of a 2-3 cleft perianth, and a germen with four styles; the perianth hardening around the fruit as it ripens; the fruit an achénium.—**COMMON SPINACH**, or **GARDEN SPINACH** (*S. oleracea*), is in general cultivation for the sake of its young leaves, which are a favorite and wholesome vegetable, either prepared by boiling, or by frying with a little butter. Two very distinct varieties are cultivated: **PRICKLY SPINACH**, which has the leaves somewhat triangular and arrow-headed, and the fruit rough with prickly-like projections; and **SMOOTH SPINACH**, or **ROUND SPINACH**, (*S. glabra* of some botanists), with the leaves more round and blunt, and the fruit smooth. **SPINACH** is an annual. Its stem rises to the height of from 2 to 4 ft.; the male flowers are in long spikes, the female in clusters close to the stem. After the stem begins to be developed, the leaves become bitter, and unfit for use. This bitterness appears also at an earlier period in dry weather, or in poor soil; and the more luxuriantly that Spinach grows, the better it is. It is sown in spring, and is ready for use in a very short time; or it is sown in autumn, thinned out, and used early in spring. The smooth Spinach is very generally preferred for the former purpose, and the prickly kind for the latter; but a somewhat intermediate variety, called Flanders Spinach, is now often used for both, being particularly esteemed for the large size of its leaves. The native country of Spinach is not well known, but is believed to be some part of Asia, as the plant was introduced by the Arabs into Spain, and thence diffused over Europe. Another species (*S. tetrandra*) is cultivated, and much esteemed, in India. The name of Spinachis also given to a number of other plants of very different botanical characters, but which have the same bland and nutritious qualities, and are used in the same way.—**NEW ZEALAND SPINACH**

is *tetragonia expansa*, a plant of the natural order *mesembryaceæ*, sub-order *tetragoniæ* (nat. ord. *tetragoniaceæ* of Lindley), a trailing, succulent annual, spreading widely over the surface of the ground, and producing a great abundance of stalked ovate-rhomboid leaves. The young stems and leaves of this plant are much used in New Zealand, and have now come into very general use also in other parts of the world, as a kind of spinach. It is cultivated in the middle and s. of Europe and in Britain, succeeding well even in Scotland with the slightest aid of a hot-bed in spring.—PATIENCE DOCK, or GARDEN PATIENCE (*rumex patientia*; see DOCK), is called in Germany ENGLISH SPINACH, and was formerly much cultivated in England, but is now neglected.

SPINAKER. See YACHT.

SPINAL COLUMN, or **SPINE**, **THE**, is the most important and characteristic part of the skeleton of the highest animal sub-kingdom, which includes mammals, birds, reptiles, amphibians, and fishes. In each of these classes it is composed of a series of bones placed one above, or in front, of another, and called the *vertebræ*; and hence, these animals, having this distinguishing characteristic in common, are all included in the term *vertebrates*. The *vertebræ* vary greatly in number in different animals, and even in members of the same class, and the number have no apparent relation to the other organs of the animal. Moreover, in their shape, they differ extremely, even in different parts of the same spine, in accordance with their special functions. In man, the number of *vertebræ* which collectively form the spinal column is 7 in the neck (cervical *vertebræ*), 12 in the back (dorsal *vertebræ*), 5 in the loins (lumbar *vertebræ*), all of which are capable of being detached from one another, and are termed *true* *vertebræ*; and 5 *vertebræ* ossified together, and forming the sacrum, and 4 or 5 similarly united forming the termination of the column, and constituting the bone called the coccyx, which are known as *false* *vertebræ*. However long or short the neck may be, every mammal has 7 cervical *vertebræ*, excepting the three-toed sloth, which has 9, and the sea cow, which has 6. In the other regions of the spine no such law exists. Each *vertebra* is attached to the two between which it lies by numerous strong and more or less elastic ligaments, and between each pair of *vertebræ* there is interposed a lenticular disk of fibro-cartilage, which acts as a buffer. By these arrangements the spinal column is rendered highly elastic, the communication of jars or shocks is prevented, and a very considerable general range of movement permitted, although the motion between any two adjacent *vertebræ* is slight. The elasticity of the column is further increased by the component *vertebræ* being arranged in curves, instead of being placed perpendicularly. The curves should be exactly in the antero-posterior direction, any well-marked lateral deviation from the perpendicular being abnormal; but a very slight lateral curvature with the convexity to the right may often be detected in the upper and middle parts of the back, and is supposed to be dependent on the more frequent use and greater strength of the right arm as compared with the left. From their position they are termed the cervical, dorsal, lumbar, and pelvic curves. The dorsal and pelvic curves have their concavities in front, and thus enlarge the spaces in which the thoracic and pelvic viscera are contained; the two other curves are convex anteriorly, and thus afford support to the parts above them. The upper three curves are so arranged that their chords are in the same vertical line in the erect position of the body, and this vertical line corresponds with the line of gravity of the head. The cause of these curves is to be sought for partly in the shape of the vertebral bodies, and partly in that of the intervertebral substance. Among the uses of these curves it may be mentioned (1) that they enable the spine to bear a greater vertical weight than it could otherwise maintain; it is calculated that nine times as great a vertical force is required to bend it as if it had been straight; (2) that they facilitate the movements of the body, especially in the act of running; and (3) that they are so disposed as to protect the cord in movements of the spine. Similar curves are seen in the spine of other mammals, though the degree of flexure is liable to great deviations. The lumbar curve, which has especial reference to the erect position, is always much less marked than in man.

The vertebral canal formed by the apposition of the spinal foramina, or neural arches (see SKELETON), and containing and protecting the spinal chord, varies in its size at different parts of the column. It is largest in its antero-posterior diameter in the neck and loins (measuring at the last lumbar *vertebra* $\frac{3}{4}$ of an inch), where the antero-posterior movements of the spine are greatest, and where the cord is least closely attached to the *vertebræ*; while in its lateral diameter it is greatest at the atlas, where it measures nearly an inch and a half. A transverse section of the canal is nearly circular through the greater part of the back. The intervertebral foramina through which the nerves emerge vary in shape and position in different parts, but are always of sufficient size to prevent injurious pressure on the nerves during movement of the spine; and in the dorsal region, which is the ordinary seat of angular curvature, the nerves are so protected by bony arches that they may escape injury, even when the bodies of several dorsal *vertebræ* have been destroyed by ulceration.

SPINAL CORD or **MARROW**, **THE STRUCTURE AND FUNCTIONS OF.** The spinal cord is that elongated part of the cerebro-spinal axis (see NERVOUS SYSTEM) which is contained in the spinal canal from the *foramen magnum*, at the base of the skull, superiorly, to the first or second lumbar *vertebra* inferiorly, where it merges into the *filum terminale*, which extends to the lower end of the sacral canal, and in no way differs structurally

rally from the proper spinal cord, except that no nerve-roots are connected with it. The membranes by which it is protected from danger, and kept in its proper position, are described in the article NERVOUS SYSTEM. Its length varies from 15 to 18 in., and it presents a difference in its diameter in different parts, there being an upper or cervical, and a lower or lumbar enlargement. In form it is a flattened cylinder. It is almost completely divided, along the median plane by an anterior and posterior fissure, into two equal and symmetrical parts. The anterior fissure is more distinct and wider at the surface than the posterior fissure, but it only penetrates to about one-third of the thickness of the cord, while the posterior fissure extends to about half the thickness of the cord. The two halves are hence only united near the center by a commissural band, which is traversed by the "spinal canal" extending downward from the fourth ventricle (see BRAIN), and about one-hundredth of an inch in diameter. A posterior and an anterior lateral furrow (two shallow depressions, the latter being scarcely perceptible) further divide each half of the cord into a posterior, a lateral, and an anterior column; these two furrows corresponding with the lines of attachment of the posterior and anterior nerve-roots. The separation of the antero-lateral columns into the "anterior" and the lateral columns is made more obvious internally by the mode in which the gray or vesicular nervous matter (described in the article NERVOUS SYSTEM) is arranged in relation to the white or fibrous matter. Although the distribution of the gray matter differs considerably in different parts of the cord, it usually presents in a transverse section the form of two somewhat crescent-shaped masses, whose convexities are turned toward each other, and are connected by the gray commissure, while their cornua are directed toward the surface of the cord; the posterior peak on each side nearly reaches the posterior lateral furrow, while the anterior, though the larger cornu, does not approach quite so near the surface at the assumed anterior furrow. The enlargement of the cord in the cervical and lumbar region, where the great nervous plexuses are given off, is chiefly due to the increase, at those points, of gray matter, which is comparatively deficient in the interval between them. The white substance seems to increase regularly from the lower to the upper part of the cord; and this fact, as Dr. Carpenter remarks, seems to indicate the probability that the longitudinal columns serve (as formerly supposed) to establish a direct connection between the encephalic centers and the roots of the spinal nerves. Careful microscopic investigation has revealed the fact that the root-fibers of the spinal nerves run two very distinct courses in the substance of the cord; the first *transverse*, and the second *longitudinal*. The transverse fibers traverse the cord horizontally or obliquely, and appear to pass out in the other set of roots connected with the same segment, either on its own or on the opposite side of the median fissure; while the longitudinal fibers in part connect the posterior roots directly with the posterior column without passing into the vesicular matter, but for the most part enter the gray matter, and emerge from it into the posterior column, or into the posterior part of the lateral column of the same or the opposite side. How far these longitudinal fibers run up or down the cord, is undecided. It is probable that *some* of them are longitudinal commissures, serving to connect the nerve-roots of one segment of the cord with the vesicular matter of another above or below it, and it is possible that *all* are of this character, in which case the spinal cord will be the real center of all the nerve-fibers connected with it.

In considering the functions of the spinal cord, we have to regard it in two distinct points of view—viz., in the first place, as a *conductor* of nervous force between the nerve-trunks and the brain; and in the second place, as an *independent nervous center*. As a mere *conductor* of nervous force, its functions and behavior are the same as those of a nerve-trunk; for, as Dr. Carpenter observes: "If it be divided, all the parts of the body which are solely supplied by nerves coming off below the point of section are completely paralyzed, as far as regards sensibility and voluntary movement; no impressions made upon them having the least power to affect the consciousness, and no exertion of the will being able to determine contraction of the muscles. This state of *paraplegia*, which may be experimentally induced in animals, is frequently exhibited in man, as a result of injury or of disease that seriously implicates the spinal cord; and as it has been shown that among the lower animals complete reunion of the cord may take place after complete division, as indicated by the entire restoration of its functional powers, and the complete reintegration of its structure, so have we reason to believe that a similar regeneration may take place, to a considerable extent, in man, this being marked by a gradual return of sensibility and power of voluntary movement in the lower limbs, which had been at first completely paralyzed."—*Human Physiology*, 6th ed., pp. 529-30. There can be little doubt that the gray matter is essentially the conductor of *sensory* impressions, for if the anterior, posterior, and antero-lateral columns are divided as completely as possible, the gray substance remaining uninjured, the sensibility of the parts below is unaffected; while, conversely, if the gray substance is divided, while the white columns remain uninjured, sensibility is almost totally extinguished. M. Brown-Sequard, whose researches on the nervous system are of the highest importance, has shown that the central portions of the gray substance are the most effective in the transmission of sensation. He likewise brings forward strong evidence to prove that there are special conductors in the spinal cord for the sensations of touch, pain, temperature, and muscular contraction, none of which can convey other sensations than their own. Notwithstanding its singular power

of conducting sensory impressions, the gray substance is itself insensible. Among his other remarkable discoveries in connection with this subject, Brown-Sequard has found, that on dividing one-half of the spinal cord of an animal, not only is anæsthesia (or loss of sensation) established on the opposite side of the body, but there is also produced a state of hyperæsthesia (or exalted sensibility) on the same side, which begins to appear a few hours after the operation, and continues in dogs for about 20 days, in cats about 14 days, and in guinea-pigs for many months, after which the sensibility falls below its usual standard. With regard to the conduction of *motor* impulses, there is great uncertainty. Considerable differences have been shown to exist in the position of the motor tracts in different parts of the cord, and Brown-Sequard concludes from his experiments on the effects of section, that while in the dorsal region, all parts, except the posterior columns, are employed in the conveyance of the orders of the will to the muscles, in the upper part of the cervical region, most of these conductors are in the lateral columns and in the gray substance between these and the anterior column.

We have now to consider the spinal cord as an *independent nervous center*. The simplest, and, at the same time, the most decisive evidence of the independent power of the spinal cord, is derived from the motion exhibited by the limbs of animals when irritation is applied to them after section of the cord at some point above the entrance of their nerves; the fact that these movements are reflected through the cord, and do not result from direct stimulation of the part irritated, being shown by their complete cessation when the nerve-trunks are divided. Thus, if a frog be pithed by dividing the cord between the occipital foramen and the first vertebra, an unusual convulsion takes place while the knife passes through the nervous center; but this quickly subsides, and if the animal be placed on the table it will resume its ordinary position. It is quite unable to move by any voluntary effort; but if a toe be pinched, the limb is instantly drawn up, and seen to push away the irritating agent, and then draw up the leg again to the old position.

From these and other experiments, we may conclude (1) that the spinal cord *in union with the brain*, is the instrument of sensation and voluntary motion to the trunk and extremities; and (2) that the spinal cord may be the medium for the excitation of movements, *independently* of volition or sensation, either by direct irritation of its substance, or by the influence of a stimulus conveyed to it from some surface of the trunk or extremities by its nerves distributed upon that surface.

SPINAZZOLA, a city of southern Italy, in the province of Bari, 40 m. s.e. of Foggia. Pop. '81, 10,353. The chief productions are wine and oil. S. was birthplace of Pope Innocent XII.

SPINDLE TREE, *Euonymus*, a genus of plants of the natural order *celastraceæ*. This order contains about 260 known species, all small trees or shrubs.—The genus *euonymus* has a lobed capsule, and seeds surrounded by an aril, which in some of the species is remarkable for its brilliancy of color. The common spindle tree (*E. Europæus*), a native of Britain, chiefly of the southern parts, and of great part of Europe, is very ornamental when in fruit, and its aril is of a fine orange color. It is a shrub rather than a tree. The wood is hard and fine-grained. It is used for the finer articles of turnery, and for skewers. It was formerly used for making musical instruments and for spindles, whence the name of the shrub. In Germany, the shoots are bored for tubes of tobacco-pipes. Charcoal made of it is much valued for crayons.

SPINE, or **THORN**, in botany, is a sharp-pointed projection of the wood of a stem or branch, and essentially differs from a prickle (q.v.) in being connected with the wood, and covered with bark. A spine is, in fact, a branch arrested in its growth and modified. In some trees and shrubs, as in the sloe, branches which bear leaves often terminate in the form of a spine. Cultivation, or whatever tends to increase the luxuriance of a plant, diminishes the tendency to produce spines. The name spine is also given to the sharp extremities of the midrib of leaves, and to the sharp angular projection of the margin of hard leaves, as in the holly. In some plants, the stipules are metamorphosed into spines.

SPINE, CURVATURE OF THE. There are two perfectly distinct forms of curvature, viz., **LATERAL CURVATURE**—arising from weakness of the bones, ligaments, and muscles, and fearfully common in girls of the middle and upper classes, between the ages of 10 and 16—and **ANGULAR CURVATURE** (frequently known as **POTT'S CURVATURE**, or **THE MALADY OF POTT**, in consequence of that eminent surgeon having been the first to describe its true nature), which consists of caries of the bodies of the vertebræ, and is by far the more serious affection of the two.

"*Lateral Curvature, or Distortion*, denotes deformity of the bones of the spine and chest; with corresponding change of the structure in relation to them. It is called 'lateral,' from the spine being curved sideways; and to distinguish it from 'angular' deformity, in which the spine is directed from behind forward, owing to excavations in its forepart from caries." The above definition is taken from Mr. Shaw's article on this affection in Holmes's *System of Surgery*, vol. iv. p. 844, an article from which we have

borrowed freely in relation to the symptoms and causes of the disease. The first thing that commonly attracts attention is a projection of one scapula, or an elevation of one shoulder, generally the right; the right shoulder and right side of the chest being unnaturally high and rounded, while on the left side, the shoulder is depressed, and the side of the chest concave. On examination, the spine is found to have acquired a spiral appearance, "not unlike what might have been produced if it had been taken, when soft, at both ends by the two hands, and twisted as a washerwoman wrings a wet cloth."—Shaw, *op. cit.* In advanced stages of the distortion, the dorsal curve increases abruptly to such an extent as to render it angular, the attending contortion being similarly abrupt. This condition gives rise to various changes, including a *humped* appearance, a great displacement of the ribs, a diminution of the cavity of the chest, and a proportionate wasting of the lung. In consequence of these physical changes, the patient can no longer walk in a simple and natural manner, but exhibits a halting, jerking, awkward gait.

The following may be noticed amongst the principal causes of lateral curvature: 1. The suppleness of the spine in the young, its structures being then more gristle than bone, and the column virtually immature. 2. Weakness of the muscles, which are seldom properly exercised in girls of the age and class in which this disorder occurs. This muscular debility is usually followed by deterioration of the bones and their ligaments, and this, apart from other obvious and direct bad effects, tends to make all the component parts of the spine—vertebræ and articulations—more prone to yield to the superincumbent weight, and to become distorted. These evil results are increased by prolonged stooping. When we enter a school, shortly before the breaking up of the class, we usually find most of the pupils standing or sitting in a tired lounging position. They are instinctively relieving the pain of over-fatigue by throwing the weight on the insensible fibrous structures, and thus relieving the aching muscles. When such attitudes are long indulged in, the ligaments undergo a process of over-stretching, and a general looseness of the vertebral joints is the result. By standing on one leg, or, more correctly speaking, by throwing all the weight of the body on one foot, the body is kept upright with the least possible expenditure of muscular power. Hence, a weak and fragile girl is induced to adopt this position. Too long indulgence in this habit will, to a certainty (for anatomical reasons, into which we have not space to enter), aggravate existing curvature, and induce it, if it did not pre-exist.

However slight a curve in the spine of a young girl may be, it ought to be deemed of importance; for when the column inclines laterally even to a slight degree, the superincumbent weight ceases to be supported on the line of the vertical axis, and falls on the oblique processes of the side to which she leans; and these processes becoming rapidly diminished in length by absorption, induced by this abnormal pressure, general distortion rapidly commences. With regard to the final issue of a case, distortion beginning at the age of 10 is more dangerous than at 14, because the disease runs a more rapid course in the younger cases. A cure is, for the same reason, more easily effected in the younger patient. If the patient's age be beyond 16, little can be done beyond checking the further progress of the deformity.

Before discussing the treatment of these cases, it is necessary to say a word regarding an important preventive measure. When a girl is defective in muscular power, disinclined to take exercise, and prone to distortion of the spine, the sitting position does not afford her rest, in consequence of the great efforts she has to make in order to keep the body erect. A patient in that condition will derive benefit from being obliged to lie for two or three hours daily, at divided intervals, on a sofa or board. When the deformity has actually occurred, gymnastic exercises suggested by the medical attendant will not unfrequently, when continued for some time, have the effect of loosening the connection of the bones, of facilitating their falling into their proper places, when extension is employed, and of restoring to the spine a portion of its lost suppleness. Mr. Shaw suggests the following simple plan for attaining the same end: "Let the patient lie on one side, with a firm cylindrical pillow, 6 in. in diameter, placed under the gibbosity of that side, and let her rest her weight on the pillow: the effect will be to counteract and reverse the curve. The same may be done alternately on the two sides. The posture may be continued each way for a quarter of an hour at a time, and be repeated twice or thrice daily."—*Op. cit.*, p. 858. There are two methods of extending the curved spine, viz. (1), by stretching the body while the patient is recumbent; and (2) by letting the patient remain upright, and using spinal supports. As each method has its own advantages, a combination of them will often afford the best results. The chief objections to the former are the necessary confinement, comparative seclusion, and interference with the routine of study. Any mode of treatment with the view of producing extension of the spine must be continued for months in order to be of any avail. It would be altogether out of place to notice in this article the various extending beds, apparatuses for exercise, and different kinds of spinal supports that have been devised by surgeons and anatomical mechanicians, and we will merely observe that mechanical supports must be tried with great caution. They are always more or less irksome to bear, and if they are not doing good, are almost sure to be doing harm. On this subject, the reader may consult Heather Bigg's work entitled *The Spine and Upper Extremities*.

Angular curvature consists, as already mentioned, of caries of certain vertebrae, which first consumes the bones and fibro-cartilages, and subsequently excites a discharge of pus. The first symptom of this affection is the appearance, at the seat of the caries, of a prominence of one or more of the spinous processes. This "growing out" of the back, as patients frequently term it, is due to the destruction of a portion of the column. In an advanced stage the spinal ridge will stand out prominently, the knob of each process being distinctly visible; and finally, a distinct angular projection is developed. The consequences of this disease are thus summed up by Druitt: "1. In favorable cases the diseased bones collapse, and are ankylozed; abscesses, if they form, are healed, or their matter is absorbed, and the patient recovers in two or three years, with more or less deformity, which is, of course, incurable. 2. In some fatal cases the patient dies suddenly from two or three of the diseased vertebrae giving way, and crushing the spinal cord; or from dislocation of the odontoid process, owing to ulceration of its ligament; or from the bursting of abscesses into the spinal cord; or from their bursting into the pleura or peritoneum; but more frequently death is caused by slow irritation and exhaustion, consequent on the formation of psoas or lumbar abscesses."—*The Surgeon's Vade mecum*, 8th ed. p. 348. The most essential point in relation to treatment is rest, and the most effectual method of arresting motion between the diseased vertebrae, and of keeping them at rest is by placing the patient in a recumbent position on his back. If possible, an invalid bed should be procured, provided with contrivances for enabling him to lie upon it, day and night, without rising. Local counter-irritants, such as compound tincture of iodine, are often useful; and good diet, backed, if necessary, by cod-liver oil and tonics, must be prescribed. In conclusion, sufferers from any form of real or suspected spinal disease are earnestly warned to avoid the numerous quacks, whether in or out of the medical profession, who have taken up the spine as a specialty.

SPINEL, a mineral allied to corundum, consisting chiefly of alumina, with smaller proportions of magnesia, silica, and protoxide of iron. It occurs in crystals, which are often octahedral, and is chiefly found in Ceylon and Siam. Its colors are various; red, blue, green, and black. It is much prized as a gem; red spinels are commonly called rubies; the *balas ruby* is a rose-red spinel, and a violet-colored spinel is known as *alaman-dine ruby*.

SPINET (Ital. *spinnetta*), an old-fashioned stringed musical instrument with a keyboard, smaller and weaker than the harpsichord, and, like it, one of the precursors of the piano-forte. Each note had but one string, which was struck by a quill jack acted on by one of the finger-keys. The strings were placed horizontally and nearly at right angles to the keys, as in the square pianoforte; and the general outline of the instrument nearly resembled that of a harp laid in a horizontal position, with the keys occupying the position of the sounding-board; on which account the spinet, when first introduced, was called the couched harp.

SPINK, a co. in e. S. Dakota, drained by the Dakota river; 1505 sq.m.; pop. '90 10,581. The surface is uneven and the soil is fertile, furnishing good pasturage. Co. seat, Redfield.

SPINNER, FRANCIS ELIAS; b. N. Y., 1802; learned several trades, and was afterwards a merchant. He was auditor and deputy naval officer of the port of New York, 1845-49, a democratic member of congress, 1855-57, and afterward a republican member and chairman of the committee on accounts. He was treasurer of the United States, 1861-75. In the latter year he was an unsuccessful republican candidate for comptroller of New York state. His services as treasurer were of great value. He died 1890.

SPINNING is the art of combining animal and vegetable fibers into continuous threads fit for the processes of weaving, sewing, or rope-making. The most primitive spinning apparatus is the spindle and distaff, representations of which are to be seen on the earliest Egyptian monuments. The distaff was a stick or staff upon which a bundle of the prepared material was loosely bound, and which was held in the left hand or stuck in the belt; the spindle was a smaller tapering piece to which the thread was attached. By a dexterous twirl of the hand the spindle was made to spin round and at the same time recede from the spinster, who drew out between the forefinger and thumb of the right hand a regular stream of fibers so long as the twisting of the spindle lasted. It was then drawn in, the new length of thread wound upon it, and the operation was renewed. An obvious improvement on this was to set the spindle in a frame and make it revolve by a band passing over a wheel driven either by occasional impetus from the hand or by a treadle; this constituted the *spinning-wheel*, which is said to have been invented in Nuremberg as recently as 1530. In the spinning-wheel in its most improved form, and as usual for flax, a bobbin or "pirn," with a separate motion, was placed on the spindle which had a bent arm—a flyer or flight—for winding the yarn on the bobbin. The spindle and bobbin revolved at different rates, the revolutions of the spindle giving the twist, and the difference of the rate causing the winding on. The two-handed wheel had two spindles and pirns a little apart, with the distaff or "rock" stuck into the frame between them, and the spinster produced a thread with each hand. The spinning of flax on such wheels for the manufacturer was an important branch of domestic industry in the northern counties of Scotland as late as 1830, if not later.

Neither the spinning-wheel nor the hand could spin more than one, or at most two threads at a time, and therefore, with the rapid increase of population, and the improvements made in the process of weaving (q.v.), they became quite inadequate to supply the demand for yarn: but an accident, it is said, about the year 1764, led to an invention by which eight threads could be spun at once; and this was soon improved upon until 80 could be produced as easily. This was the invention of the *spinning-jenny* for cotton-spinning, by James Hargreaves, at Stankhill, near Blackburn in Lancashire. In this machine, a number of large reels of cotton formed into a thickish coil, called a *roving*, were set on upright fixed spindles, and the ends of the rovings were passed between two small movable bars of wood placed horizontally and under the control of the spinner, who could thus make them press more or less on the roving, and consequently increase or decrease the draw upon it from the spinning spindles, which were set in a row at the other end of the frame, and all capable of being set in motion simultaneously by the wheel. The success of the spinning-jenny was considerable, but its history has been too often told to be required here; and even previous to its invention, a better idea had been started and acted upon by others, and was afterward brought to such perfection, that the invention of Hargreaves soon passed into obscurity.

In order to understand the operations of spinning as now practiced, and as improved by the invention alluded to, it is desirable, in this place, to say a few words upon the preparation of the fibers for the process of spinning. In the first place, if wool or cotton,

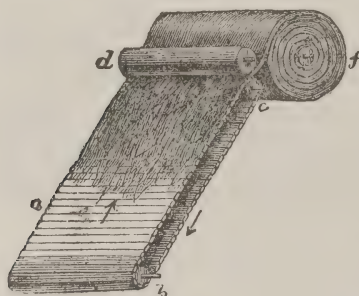


FIG. 1.

the "blower" or "opener," and being put into a shaft, is there acted upon by a stream of air violently driven in by machinery, which blows it forward, removes extraneous matters, and so separates the fibers that they pass out at the other end in an exceedingly light flocculent state, and ready for being formed into *laps*. This operation consists in laying the material very equally on an endless apron made of small bars of wood, and of the width of the frame of the machine in which they are placed. This apron (*a*, fig. 1) passes round two rollers, placed at a little distance apart, as in fig. 1, *b*, *e*, the rollers being moved by machinery. The arrows indicate the direction in which the apron moves; and as the operator covers its entire surface with a thin layer of the fiber, it passes under under the roller *d*, and is taken on to the roller *e*, in the form of a compressed layer of cotton or wool, called a *lap*. When the roller *e* is full, it is removed, with its lap *f*, to make way for another. Much care is taken in weighing out and distributing the material of these laps, because upon this first operation the ultimate size of the yarn depends.

The laps are taken to the *carding-machine*, consisting of a series of cylinders revolving in a frame, and placed so close together that they almost touch each other. Each cylinder is covered with a coating of fine steel wire points, which are stuck in leather, or some other flexible material, and are technically called *cards*. The production of these cards by machinery is in itself a marvel, and the automatic machines for making them are wonderfully effective. Each piece of wire is bent and put through two holes in the leather so as to form two points on the other side, and these are slightly bent all in one direction. There are many variations upon this arrangement of the wires, but the general principle is the same in all. The machine for making the cards cuts the wire to the right lengths, bends them, pierces the holes in the leather, inserts the wires, and finishes by giving them the slight sloping direction which is essential.

The lap is made of the same width as the cylinders of the card-machine, and is so adjusted that, as it unwinds from its roller, it passes in between a pair of the carding cylinders, the steel wire teeth of which seize hold of the individual fibers, and drag them in one direction until they are caught by other cylinders, and so carried from one to another, always being pulled in a straight direction until they are laid as nearly as possible side by side, and are given off in a thin cobweb-like film at the last cylinder, where it is prevented from continuing its journey round the cylinders by a small bar of metal called the *doffer*, which, with a gentle and peculiar motion, removes it from the cylinder. The film of fiber is of the same width as the cylinder of the carding-machine, but it is gathered together by the operator, who passes it through a smooth metal ring, and

between two small polished rollers, the revolutions of which carry it forward and deposit it in a deep tin can in the form of a loose untwisted column of cotton or wool, about an inch in thickness, which is called a *sliver*. A small portion of this arrangement is shown in fig. 2, which represents a carding-machine with only two carded cylinders, *a* and *b*; they are, however, much more numerous. There is also a concave piece of carding, *c*, which was formerly much used, but has lately given way to additional cylinders, but it makes the action more apparent in a drawing; *d* is the lap drawn on by the action of the two small rollers *e, e*, which slightly press it as they revolve. It is quickly distributed all over the surface of the large cylinder *a* by means of its numerous wire-teeth; and as it passes the roller *b*, the teeth of which move in an opposite direction, as indicated by the arrows, the fibers are caught off the large, and are carried round the small cylinder until they reach *f*, where they are stripped off by the doffer *g*, and are passed through the ring *h*, and the rollers *i, i*, into the tin receiver *k*. The sliver is now in the first stage of spinning; it has next to be drawn out very gradually until it is not thicker than a quill; and, in drawing it out, the operator gives it a very slight twist, still leaving it so loose in structure that it will break with a slight touch; in this state it is called a *roving*; and it was at this stage that the spinning-jenny began to operate upon it. The rovings, which were wound as they were drawn upon large reels, were unwound by the machine, and were still further drawn out and firmly twisted and wound on to spindles or cops, the drawing being regulated by the pressure of the wooden bars of the jenny, which was within reach of the operator's hand.

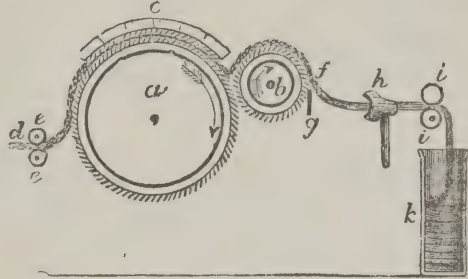


FIG. 2.

The *throstle-machine*, patented by Arkwright in 1769, had for its object the drawing of the rovings through a succession of pairs of rollers, each pair in advance of the others, and moving at different rates of speed. The first pair receive the sliver, compress it, and pass it on to the second pair, which revolve at a greater speed, and thus pull it out to exactly the number of times greater length that their revolutions exceed those of the other pair—in number it is usually eight times—and as the first roving is passed through a second, third, and sometimes fourth machine, the finished roving is 32 times longer than the sliver. As the roving issues through the last rollers of each machine it is received on *spools* or *reels*, calculated to hold a given quantity; and these are transferred to the *spinning-frames*, which resemble the *roving-frames*. Here the roving takes the place of the sliver; and, as it unwinds from the spool, is drawn through successive pairs of rollers, moving as before at different rates, each succeeding pair faster than the backward ones, so that the roving gets thinner and thinner, until the tenuity is carried as far as desirable. It is then carried on to a spindle which revolves with great rapidity; and, by means of a simple arrangement, is made both to twist the thread and wind it on the spindle ready for the weaver.

This system produces too great a strain upon the thread in its progress to admit of its being drawn so fine as is wanted for many purposes, and this led to the invention of the *mule-jenny* by Crompton (q.v.) in 1779, which has a traveling frame upon which the spindles are set. This frame is now made long enough to carry hundreds of spindles, and it gently draws out and twists the thread after it leaves the last pair of rollers; and when it has reached its limits—now several yards, but in Crompton's time only five feet—it rapidly returns, winding up the spun thread on the spindles as it goes back. These machines are now applied, with various necessary modifications, to cotton, wool, flax, silk, and other textile materials, and the effect they have exerted upon our manufactures is more wonderful than anything in the whole history of commerce. Previous to the invention of the mule, few spinners could make yarn of 200 hanks to the pound (the hank being always 840 yards). At the same time, the natives of India were weaving yarn of numbers ranging between 300 and 400. Now, however, in England they have reached such extraordinary perfection that Messrs. Houldsworth of Manchester have succeeded in making No. 700, which was woven by the French firm, Messrs. Thivel & Michon of Taware, and others far too fine to weave, the greatest tenuity reached being 10,000, a pound of which would reach 4770 miles. This was made to test the perfection of the machinery, but was of no practical value.

The most modern improvements in spinning are in the machines of Messrs. Platt & Co., of Oldham, which combine all the operations of carding, roving, and spinning in one machine. These and similar machines have now come almost into universal use for cotton and wool.

SPINOLA, AMBROSIO, Marquis de, 1569–1630; b. Italy; served in the Spanish navy, against the English and Dutch. In 1602 he led a force of 9000 veterans to the Neth-

erlands against Maurice of Nassau. Made chief commander of the Spanish army there; he forced Ostend to surrender in 1604, after a siege of three years. He continued his operations against Maurice till the truce of 1609, when he took command of the Spanish troops in Germany. He captured Jülich in 1622, and Breda in 1625. He afterward commanded the Spanish army in Italy.

SPINOZA, BARUCH (= *Benedict*), one of the greatest philosophers of modern times, was born at Amsterdam Nov. 24, 1632. His parents, rich Portuguese Jews, had their son diligently instructed in the Bible and its commentaries, and the Talmud. But after having mastered both, and imbibed the philosophical spirit of such commentators as Aben Ezra, he was allowed—the more readily that his sickly constitution unfitted him for a commercial career—to devote himself entirely to a life of study. Physical sciences and the writings of Descartes, to which he turned first of all, very soon drew him away from the rigid belief and practices of the synagogue; and Saul Levi Morteira, his Talmudical teacher, who had built the fondest hopes upon the genius of his pupil, was the first to threaten him with the direst punishment if he did not retract the rank heresies that he began openly to utter. Spinoza, after a time, entirely withdrew from the community of his brethren, who formally excommunicated him. A fanatic even attempted to frighten him by an either real or feigned attack upon him as he left the theater one night. At that period, the young truth-seeker made the acquaintance of the young and beautiful daughter of Van den Ende, his master in Greek and Latin, and fell passionately in love with her, but was rejected. From that time forth, philosophy became the sole aim and object of his life. In accordance with the teaching of the sages of the Mishna, Spinoza had, apart from his studies, made himself master of a mechanical craft. He had learned the art of polishing lenses. This now became the means of his subsistence. Besides, he was also an expert in the art of design, and among a number of other portraits, he drew one of himself in the dress of Masaniello.

When 29 years old he left Amsterdam, and went to Rhynsburg, near Leyden, where he wrote the *Abridgment of the Meditations of Descartes*, with an appendix—the latter being the first cast, so to say, of his *Ethics*. The year following he removed to Voorburg, near the Hague, and shortly afterward, yielding to the solicitations of his, by this time, numerous friends, he removed to the Hague itself. The elector of the palatinate, Charles Lewis, next offered him a vacant chair at the university of Heidelberg, with full "liberty of teaching," provided he would not say aught to prejudice the established religion, i.e., Christianity; whereupon Spinoza declined the both lucrative and honorable professorship. His small pittance was enough to satisfy his wants. In a similar way, he refused generous offers made to him by wealthy friends, like Simon de Vries, who intended to bestow a large sum of money on him. All he could be prevailed upon to accept was a small annuity of a few hundred florins, the rest he persuaded his generous friend to bestow upon his (De Vries's) own brother. An offer of a pension, on the condition of his dedicating a work to Louis XIV., he rejected with scorn. His domestic accounts, found after his death, show that he preferred to live on a few pence a day, to being indebted to another's bounty. He died, 44 years old, on Feb. 21, 1677. Throughout his life of study, of abstemiousness, of bodily and mental suffering—for his constitution was undermined no less by consumption and overwork, than his sensitive mind was wrought upon by the violent severance of all natural ties of affection, to say nothing of the misery of occasional want and of perpetual persecution—no complaint ever passed his lips. Simplicity and heroic forbearance, coupled with an antique stoicism and a child-like, warm, sympathizing heart, were the principal attributes of him who was nicknamed epicurean and atheist by his contemporaries. It has well been said, that no man, perhaps, was more filled with religion than Spinoza, and that to be an epicure at the rate of twopence-halfpenny a day cannot be a very serious crime.

Respecting Spinoza's philosophical system, of which we can only give the very faintest of outlines here, it must be premised that it developed itself on the basis of Descartes. The latter had inaugurated a new epoch by his "reconstruction" of knowledge. Dissatisfied both with the dogma and the skepticism around him, he cleared the ground by first doubting everything, and then laying a new foundation by *Cogito, ergo sum* (I think, I therefore am). Spinoza, however, deeply struck both with the reasonings and conclusions of Descartes, took his "I think therefore I am" merely as a starting-point to prove more clearly the existence of God than Descartes did. The consciousness of man's own existence and of his imperfect state are not, he thinks, sufficient to solve the grand problem. He therefore assumes, first of all, three fundamental things, which he calls respectively substance, attributes, and mode. By substance he understands, like Descartes, that which needs nothing else to its existence; but, unlike Descartes, he assumed only one such substance—God. Yet this term is not to be understood in the ordinary sense, for Spinoza's God neither thinks nor creates. There is no real difference, he holds, between mind, as represented by God, and matter, as represented by nature. They are one, and, according to the light under which they are viewed, may be called either God or nature. The visible world is not distinct from him. It is only his visible manifestation, flowing out of him, who is the last fountain of life and essence, as a finite from the infinite, variety from unity—a unity, however, in which all varieties merge again. Extension and thought, which, with Descartes, had been two substances,

with Spinoza become "attributes;" that which the mind *perceives* as *constituting* substance. Extension is visible thought; thought is invisible extension. The relation between substance and attributes, Spinoza illustrates by the example of an object—colorless in itself, perhaps—seen through yellow or blue spectacles. And this explains the relation between body and mind, and the complete unity between them. The mind is the idea of the body—i. e., the same thing considered under the attribute of thought. The *modus* or *accidens* is only the varying form of substance. Like the curling waves of the ocean, they have no independent existence; nay, less than these are they things of reality; but they are simply the ever-varying shapes of the substance. Substance, thus, is the only really existing, all-embracing essence, to which belongs everything perceptible to our senses, and not perceptible. Thus every thought, wish, or feeling is a mode of God's attribute of thought; everything visible is a mode of God's attribute of extension. God is the "immanent idea," the one and all. "World" does not exist as world—i. e., as an aggregate of single things—but is one complex whole and one peculiar aspect of God's infinite attribute of extension. The variety we behold in things is a mere product of our faulty conceptions, particularly of, as Spinoza terms it, our "imagination," which perceives unity as a complex of multiplicity.

On these metaphysical speculations he founds his ethics, which he deduces in a mathematical form, after the method of Euclid. The chief doctrines are: the absence of free will in man—himself only a *modus* dependent on causes without, and not within him. Will and liberty belong only to God, who is not limited by any other substance. Good and evil are relative notions, and sin is a mere negative; for nothing can be done against God's will, and there is no idea of evil in him. Utility alone, in its highest sense, must determine the good and the evil in our mind. Good, or useful, is that which leads us to greater reality, which preserves and exalts our existence. Our real existence is knowledge. Highest knowledge is the knowledge of God. From this arises the highest delight of the spirit. Happiness is not the reward of virtue, but virtue itself; and this is to be attained by a diligent following in God's ways. Sin, evil, negation, etc., are merely things that retard and obstruct this supreme happiness.

Spinoza's system, pantheism or atheism, as it has been variously called, appears to be nothing but the most rigid, most abstract, monotheism that can be conceived by man. There is only substance, only God—nought else. It was not unnatural, however, that this system should be misunderstood either as materialism or as pantheism; seeing the word "substance," which, with Spinoza, means "existence," is, in ordinary language, associated with the idea of matter or body. Be this as it may, "this most iniquitous and blasphemous human invention," as it has been called for 200 years, has become the acknowledged basis of modern German philosophy; and pious theologians like Schleiermacher did not hesitate to apply the highest terms of "pious, virtuous, God-intoxicated," to Spinoza, who, we need not add it, never left Judaism, although he left the synagogue and its human formalities.

His principal works are—*Renati Descartes Principiorum Philosophiæ, Pars I. et II., more Geometrico Demonstratæ* (Amsterdam, 1663); *Tractatus Theologicus-politicus* (anonymous, 1670); the *Opera Posthuma*, edited in the year of Spinoza's death by Ludwig Meyer, contain: *Ethica Ordine Geometrico Demonstrata*; *Tractatus Politicus*; *Tractatus de Intellectus Emendatione*; *Epistolæ*; *Compendium Grammaticæ Linguae Hebrææ*. Several minor treatises are lost; but the lately discovered *Tractatus de Deo et Homine*, published in 1862, is a most valuable addition to our materials for tracing the development of Spinoza's system. The literature on the Spinozistic philosophy is very copious, especially in Germany. Spinoza's life has even been made by Auerbach the subject of two romances. The best editions of Spinoza's works are those of Paulus (1802-3) and Bruder (1843-46). See Pollock's *Spinoza* (1880).

SPIRÆA, a genus of plants of the natural order *rosaceæ*, and of the suborder *spirææ*, in which the fruit consists of five or fewer capsular carpels distinct from the calyx, and each containing 1 to 6 seeds. The genus *spiræa* has one or more follicular, many-seeded carpels. It contains a large number of species, natives of Europe, Asia, and America, herbaceous plants and low deciduous shrubs; of the herbaceous species, two are natives of Britain, DROPWORT (*S. Filipendula*) and MEADOW SWEET or QUEEN OF THE MEADOW (*S. Ulmaria*), both with interruptedly pinnate leaves and flowers in cymes. Dropwort is a native of dry upland pastures; it is tonic and fragrant; and its tubers, which are somewhat nutritious, are in Sweden ground and made into bread. Meadow sweet is well known for the powerful fragrance of its flowers. A fragrant distilled water is prepared from them. A North American species (*S. tomentosa*), called HARDHACK in the United States, is there used as a tonic and astringent. Many of the shrubby species are frequently planted for ornament.

SPIRAL, in geometry, is the name given to a class of curves which, during their gradual regression from a point, wind round it repeatedly. Their equations are generally expressed in terms of polar co-ordinates, and are all necessarily of the form $r=f(\theta)$, where θ never signifies a function of the angle, but the angle itself or a multiple of it. Several such curves have received distinguishing epithets, either on account of the properties they possess, or from their inventor; the chief of them are—the *equable spiral* or the *spiral of Archimedes*, whose equation is $r=a\theta$ and which, commencing at the origin,

circles round and regre-des from it with unvarying uniformity; the *hyperbolic* or *reciprocal spiral* ($r\theta=a$); the *logarithmic* or *equiangular spiral* ($r=ab\theta$); which recedes from the center or origin with a velocity increasing as the distance, and always cuts the radius vector at the same angle; etc.

SPIRAL VESSELS are those very delicate air-tubes in the cellular tissue of plants which run unbranched through the different parts of the plant, and whose walls are composed of fibers spirally or circularly twined. Spiral vessels are either *free*, when their windings are unconnected with each other, or *net-like*, when the windings are involved with each other in a net-like manner. If the free spaces between the convolutions in the latter are linear, they form *lined vessels*; but if they are point-like, they form *punctate* or *porose* vessels. Spiral vessels, whose walls are formed of distinct horizontal rings, placed simply one above another, are called *annular vessels*. Spiral vessels seldom occur singly, but are generally united by cells into bundles called vascular bundles. These vascular bundles are scattered in the stems of endogenous plants; but in the stems of exogenous plants they are arranged in one or more concentric circles. Among cryptogamous plants, the ferns alone (in the most extensive signification of the term) are provided with spiral vessels. All plants which have spiral vessels are called *vascular plants*, in contradistinction to *cellular plants*, whose substance consists of cells only.

Through the operation of what laws the spiral form is assumed by spiral vessels, is still unknown, although the question has naturally been regarded as having an intimate connection with the tendency to spiral structure manifested in plants, and even in some of those cryptogamous plants in which no true spiral vessels are found; a tendency which is observed not only in spiral stems, spiral tendrils, the spiral fibers of the elaters of *jungermannia*, and the like, but throughout the vegetable kingdom generally in the spiral arrangement of leaves and of the organs which are formed by the metamorphosis of leaves. The whole subject is an extremely difficult one.

SPIRE, a very acute pyramidal roof in common use over the towers of churches. The history of spires is somewhat obscure, but there is no doubt that the earliest examples of anything of the kind are the pyramidal roofs of the turrets of Norman date. Those of St. Peter's, Oxford, and Rochester cathedrals, are good specimens of circular and octagonal spires on a small scale. Spires of this early period are much lower than those of later date. The early English style has spires of acute form over the larger towers. They are generally what are termed broach spires, i.e., the slopes spring from the cornice of the tower without any parapet, and at the point where the square changes to the octagon there is a small set-off or separate roof. Sometimes the angles at top of towers were occupied with pinnacles or sloping masses of masonry, as at Bayeux cathedral, Normandy.

In the decorated style the spires were more enriched, with a parapet and pinnacles at the top of the tower, crochets on the angles, and enriched windows.

The spires of the perpendicular and flamboyant styles are still more enriched, with flying buttresses at the angles, etc. They are sometimes perforated, and the sides of the spire filled entirely with tracery. Such spires are common in Germany, those of Strasbourg and Frieburg on the Rhine being very fine examples. As in the later styles generally, the character and beauty of the spire give place to dexterity in masonry, and many examples exist of traceried spires more wonderful than beautiful. See **GOthic ARCHITECTURE**.

SPIRES. See **SPEYER**.

SPIRILLUM. See **COMMA BACILLUS**.

SPIRIT, a name of very general application to fluids, mostly of a lighter specific character than water, and obtained by distillation. Thus, the essential oil of turpentine is called spirit of turpentine. But in a stricter sense, the term spirit is understood to mean alcohol (q.v.) in its potable condition, of which there are very numerous varieties, deriving their special characters from the substances used in their production.

SPIRIT DUCK. See **GARROT**.

SPIRITO SANTO. See **ESPIRITU SANTO**

SPIRITUALISM. Under the head of **ANIMAL MAGNETISM**, an account is given, from the skeptical point of view, of some of those mysterious phenomena which, under the name of modern Spiritualism, have recently attracted so much public attention. It is proposed here to give a more complete account of these phenomena as they appear to those who hold that they are inexplicable by the commonly received laws of physics.

That these phenomena in their higher phases—as those of trance, healing by touch, and subjection to the thought and will of another mind—are intimately allied with those of mesmerism is obvious to all who have given any careful attention to them. Spiritualists, indeed, affirm that they differ only in this—that in the one case the operator is a mortal, in the other a disembodied human spirit possessing a spiritual body instead of a physical one. Those persons most readily susceptible to mesmeric influence generally prove to be the best mediums for spirit manifestation. Wherever mesmerism has been extensively practiced, it would seem that the ground has thereby been prepared

for the operators in the unseen world; and indeed human magnetism is not unfrequently resorted to for this express purpose. Many of the earliest and foremost advocates of Spiritualism in England have traveled to Spiritualism *via* mesmerism. As is fully shown in the correspondence of M. Billault and M. Deleuze, published in two volumes in 1836, the magnetists of France anticipated by at least half a c. the revelations of what is now known as "modern Spiritualism," which was as humble in its origin as other great movements recorded in history which have so largely influenced mankind.

In the village of Hydesville, New York state, lived Mr. John D. Fox and family, much respected by their neighbors as honest upright people. The two youngest children, Margaret, then twelve years old, and Kate, nine, were staying with their parents. Soon after they had taken up their residence here, in Dec., 1847, they began to hear knockings in the house, which toward the end of March increased in loudness and frequency. Mr. Fox and his wife got up night after night, lit a candle, and thoroughly searched every nook and corner of the house, but discovered nothing. When the raps came on a door, Mr. Fox would stand ready to open it the moment they were repeated, but though he opened the door on the instant, he could detect nothing, and no one was to be seen; nor could he obtain the slightest clue to the cause of these disturbances. But through all these annoyances Mr. and Mrs. Fox clung to the belief that some natural explanation of them could be found. Nor did they abandon this hope till the last night of March, 1848. Wearied out by a succession of sleepless nights, and of fruitless attempts to penetrate the mystery, the family had retired very early to rest; but scarcely had the mother seen the children safely in bed, and was retiring to rest herself, when the children cried out: "Here they are again!" The mother chid them, and laid down. Thereupon the noises became louder and more startling. Mrs. Fox called in her husband. The night being windy, it suggested to him that it might be the rattling of the sashes. He tried several, shaking them to hear if they were loose. Kate happened to remark that as often as her father shook a window-sash, the noises seemed to reply. Turning to where the noise was, she snapped her fingers, and called out: "Here, do as I do?" The knockings instantly responded. She tried, by silently bringing together her thumb and forefinger, whether she could still obtain a response. Yes! It—the mysterious something—could see, then, as well as hear! She called her mother: "Only look, mother," she said, bringing her finger and thumb together as before. And as often as she repeated the noiseless motion, just so often responded the raps. This at once arrested the mother's attention. "Count ten," she said; ten strokes were distinctly given. "How old is my daughter, Margaret?" Twelve strokes responded. "And Kate?" Nine! "What can all this mean?" was Mrs. Fox's thought. Who was answering her? Was it only some mysterious echo of her own thought? The answers to the next question she put seemed to refute this idea. "How many children have I?" she asked aloud. Seven strokes. "Ah!" she thought, "it can blunder sometimes." And then, aloud, "Try again." Still seven strokes as before. Of a sudden a thought crossed her mind: "Are they all alive?" she asked. Silence for answer. "How many are living?" Six strokes. "How many dead?" A single stroke; she had lost a child. Then she asked, "Are you a man?" No answer. "Are you a spirit?" It rapped. "May my neighbors hear if I call them?" It rapped again. Thereupon she asked her husband to call a neighbor, a Mrs. Redfield, who came in laughing. But her mirth was soon changed. The answers to her inquiries were as prompt and pertinent as they had been to those of Mrs. Fox. She was struck with awe; and when, in reply to a question about the number of her children, by rapping four, instead of three, as she expected, it reminded her of a little daughter, Mary, whom she had recently lost, the mother burst into tears.

Of course a knowledge of these things could not be kept secret. The news soon spread, and the utmost excitement prevailed in the little village and beyond it. Neighbors flocked in, and the house was besieged, and the time of the family wholly taken up with curious and eager visitors. Formal depositions appeared in more than one publication. The earliest of these, published April, 1848—a pamphlet of 40 pages—contains 21 certificates, chiefly given by the immediate neighbors. Most of the witnesses offer to confirm their statements, if necessary, under oath, and express their conviction that the family had no agency in producing these sounds.

It was found that these were more marked in the presence of Kate Fox, and in the hope of getting rid of these annoyances, Kate was sent on a visit to Mrs. Fish, a married sister, at Rochester. The only result being that, while the rappings did not cease at Hydesville, a new and more extended scene of operations was given them at Rochester, whither they followed Kate, and were found also to accompany her sister, and a girl who resided with them.

On one occasion a visitor suggested that the alphabet should be called over, to see if the sounds would respond to the required letters, and so spell out a communication. A shower of raps followed, as if to say: "Yes, that is what we want!" The first message so given, was: "We are all your dear friends and relatives." Then the name of "Jacob Smith," Mrs. Fish's grandfather, was given. Previous to the spiritual telegraphy thus commenced, the only mode of communication had been by asking questions, one rap being understood as an answer in the negative, three in the affirmative, and two, doubtful, or that the answer could not then be given. It was now asked that a signal should

be given when the alphabet was required; this was responded to by five strokes, which was henceforth understood as a call for the alphabet; and so a code of signals was instituted.

Similar demonstrations occurred about this time, independently, in the homes of some of the most respectable inhabitants of Rochester. At length it was communicated by the rapping that the facts should be given to the world, with a view to open up a more extended intercourse; and instructions were given as to where, how, and by whom this was to be done. There was much difficulty in getting the parties named to take the responsibility, and incur the discredit and ridicule of this step; but their scruples were at length overcome; and on Nov. 14, 1848, a public lecture, giving a simple narrative of the facts, was delivered in the Corinthian Hall, Rochester, to an audience of about 400 people. The rappings, as had been promised, were distinctly heard in all parts of the hall; and a committee was appointed by the audience to investigate the subject, and report at a subsequent meeting. The committee all agree that the sounds were heard; but they entirely failed to discover any means by which they were produced.

This result was very different to what had been confidently anticipated, and the dissatisfied audience, amazed at the failure, appointed a second committee, which it was expected would make such an investigation as could not fail to find out the trick; and when this committee, after the strictest investigation, only confirmed the judgment of its predecessor, the excitement became intense; and a third committee was appointed, consisting of those who had shown the most determined hostility to the reports of the previous committees, and who had expressed the utmost confidence in their ability to detect the imposition. It certainly was no fault of theirs that they did not. They resorted to every means their ingenuity could devise; but no fraud could be detected, no explanation given. The "mediums" were separated, and their friends were rigorously excluded from the sittings of the committee. They were unexpectedly removed, first to one house, then to another. A committee of ladies divested them of their clothing; feather pillows were placed under their feet; the stethoscope was applied to see that there was no movement of the lungs by which the sounds could be made. Under every condition imposed the obstinate raps came—on doors, floors, walls, ceiling; the place seemed alive with them. When this final committee, baffled and mortified, made known their failure, the meeting broke up in the greatest excitement and confusion. But the object was gained: the facts were reported and commented on in all the journals throughout the country.

Circles for investigation were now everywhere formed, and not only were the rappings obtained, but new phases of these strange phenomena were constantly developed. In *Forty Years of American Life*, by Thomas Low Nichols, M.D., we read: "Dials were made with movable hands, which pointed out letters and answered questions without apparent human aid. The hands of mediums, acting convulsively, and, as they averred, without their volition, wrote things apparently beyond their knowledge, in documents purporting to be signed by departed spirits. Their writings were sometimes made upside down, or reversed so as only to be read through the paper or in a mirror. Some mediums wrote with both hands at a time, different messages, *without*, as they said, being conscious of either. There were speaking mediums, who declared themselves to be the merely passive instruments of the spirits. Some represented, most faithfully, it was said, the actions, voices, and appearance of persons long dead; others, blindfolded, drew portraits, said to be likenesses of deceased persons they had never seen—the ordinary work of hours being done in a few minutes. Sometimes the names of deceased persons and short messages appeared in raised red lines upon the skin of the medium. Ponderous bodies, as heavy dining-tables and piano-fortes, were raised from the floor, falling again with a crash and jar. Tables on which several persons were seated were in like manner raised into the air by some invisible force. Mediums are said to have been raised into the air and floated about above the heads of the spectators. Writings and pictures were produced without visible hands. Persons were touched by invisible, and sometimes by visible hands. Various musical instruments were played upon without visible agency. Strange feats of legerdemain, as the untying of complicated rope-knottings in an incredible short time, astonished many. Voices were heard, which purported to be those of spirits. In a word, over a vast extent of country, from e. to w., these phenomena existed, or were said to exist, in hundreds of places, and were witnessed by many thousands of people—numbers of whom were of the highest credibility, and the mass of those persons whose testimony no one would think of impeaching in a trial of life and death."

Many theories were invented to explain these phenomena; they are now for the most part obsolete or forgotten. Each theory generally began by exploding its predecessors, and was in turn exploded by its successors. No sooner was a theory invented to explain one class of facts than another sprang up for which it made no provision, and to which it was manifestly inadequate. Not only did the flame spread, but sometimes the extinguishers caught fire; and those who at first were its opponents, ended as its advocates. The most obdurate materialists became convinced of a future life for man by the experimental evidence spiritualism supplied. For instance, Prof. Hare instituted a series of experiments intended to prove that the phenomena were wholly due to natural causes;

and the public, and men of science in particular, were surprised when, in place of this explanation, there appeared a large work with his name as its author, entitled *Spiritualism Scientifically Demonstrated*; and with diagrams of ingenious apparatus invented by him to test the genuineness of the phenomena. The Hon. J. W. Edmonds, judge in the supreme court of appeals for the state of New York, brought to bear upon the subject a mind trained by long judicial experience, and the careful sifting of evidence. He investigated with many different mediums, and took notes as carefully as though in court. To his great astonishment he found he was himself a medium, and under the title *Spiritualism* he published two large volumes, narrating his investigations, visions, and spiritual communications. His daughter, Laura, also became a medium, and under some foreign influence would sometimes answer freely in languages with which in her normal state she was wholly unacquainted.

Reports of these marvels soon crossed the Atlantic; but in England, for a long time, they excited little serious attention, and were generally received, not only with incredulity, but with ridicule and contempt. The visit to London of Mrs. Haydon, an American medium, in 1854, first excited any considerable degree of public interest in spiritualism. Many visited her, most of whom were puzzled, some ridiculed, a few were convinced. Among the latter were Robert Owen, the founder of English socialism, and Dr. Ashburner, the translator of Reichenbach, and the colleague of Dr. Elliotson in the establishment of the *Zoist* and of the Mesmeric infirmary. In 1855 a more remarkable medium came to England, Mr. Daniel Dunglas Home. The manifestations which occurred in his presence were soon the subject of newspaper controversy. From that time to this they have been seen and tested repeatedly by scientific and other witnesses of the highest credit and social position; and they made him a frequent and welcome guest at the Tuileries and at the courts of Berlin and St. Petersburg. A full account of his strange experiences is given in his autobiography, entitled *Incidents in My Life*. They include nearly the whole range of "manifestations" referred to in the important report of which we are about to speak.

In Jan., 1869, the London dialectical society appointed a committee "to investigate the phenomena alleged to be spiritual manifestations, and to report thereon." The committee invited evidence from all sides, and especially solicited the co-operation of scientific men, and resolved itself into sub-committees for experimental investigation and test. In July, 1871, the committee presented its report, with minutes of evidence, reports of *séances*, and other documents, making a volume of 412 large octavo pages. The committee state that "a large majority of the members of your committee have become actual witnesses to several phases of the phenomena, without the aid or presence of any professional medium, although the greater part of them commenced their investigations in an avowedly skeptical spirit." A synopsis of the evidence is also given as follows: "Thirteen witnesses state that they have seen heavy bodies—in some instances men—rise slowly in the air, and remain there for some time without visible or tangible support. Fourteen witnesses testify to having seen hands or figures, not appertaining to any human being, but lifelike in appearance and mobility, which they have sometimes touched or even grasped, and which they are therefore convinced were not the result of imposture or illusion. Five witnesses state that they have been touched by some invisible agency on various parts of the body, and often where requested, when the hands of all present were visible. Thirteen witnesses declare that they have heard musical pieces well played upon instruments not manipulated by any ascertainable agency. Five witnesses state that they have seen red-hot coals applied to the hands or heads of several persons without producing pain or scorching; and three witnesses state that they have had the same test applied to themselves with the like immunity. Eight witnesses state that they have received detailed information through rappings, writings, or in other ways, the accuracy of which was unknown at the time to themselves or to any persons present, and which, on subsequent inquiry, was found to be correct. One witness declares that he has received a precise and detailed statement, which, nevertheless, proved to be entirely erroneous. Three witnesses state that they have been present when drawings, both in pencil and colors, were produced in so short a time, and under such conditions, as to render human agency impossible. Six witnesses declare that they have received information of future events, and that in some cases the hour and minute have been accurately foretold days and even weeks before. In addition to the above, evidence has been given of trance-speaking, of healing, of automatic writing, of the introduction of flowers and fruits into closed rooms, of voices in the air, of visions in crystals and glasses, and of the elongation of the human body."

One of the latest scientific investigators of Spiritualism is Mr. William Crookes, F.R.S., discoverer of the metal thallium, editor of the *Chemical News* and of the *Quarterly Journal of Science*. In the latter journal for Jan., 1874, is an article by him, entitled, "Notes of an Inquiry into the Phenomena called Spiritual, 1870-73." He attests phenomena similar to those affirmed by the dialectical society's committee and its witnesses, which came under his notice in his own house, in the light, and with only private friends present except the medium, at times appointed by himself, and under circumstances which, he says, absolutely precluded the employment of the very simplest instrumental aids.

In 1881 the chief English journals of spiritualism were *Light, Medium and Daybreak, Spiritualist, Spiritual Notes*, weekly or monthly. In the U. S., the earliest was the *Banner of Light*, founded in 1857. In 1881 it was stated that there was in Germany 1 spiritualist magazine; in Austria, 1; Holland, 1; France, 1; Belgium, 4; England, 7; Italy, 1; Spain, 5; U. S., 5; Argentine Republic, 2; Mexico, 2; Colombia, 2. The literature of the movement is very voluminous. The following, in addition to those already indicated, are the principal works on spiritualism published in England and the U. S., to which we must refer our readers for further information: *From Matter to Spirit*, by Mrs. De Morgan, with preface by Prof. De Morgan; *The Two Worlds*, by Thomas Brevior; *Footfalls on the Boundary of Another World and The Debatable Land*, by Robert Dale Owen; *History of the Supernatural*, by William Howitt; *A Defense of Spiritualism*, by Alfred Russell Wallace; *Lights and Shadows of Spiritualism*, by D. D. Home (1877); *Mesmerism, Spiritualism, etc., Historically and Scientifically Considered*, by W. B. Carpenter, F.R.S. (1877); *Transcendental Physics* (Zöllner), *Psychic Facts*, by Harrison (1880); *The Identity of Primitive Christianity and Modern Spiritualism* (2 vols.), by Eugene Crowell, M.D.

SPIROMETER, the name of an instrument devised for the purpose of measuring the vital capacity of the lungs, or for gauging the amount of air that an individual can expire after a forced inspiration.

SPIRULA, a genus of polythamous, decapodous, dibranchiate cephalopods, comprising three species, and constituting Prof. Owen's family, *spirulidae*, in which the internal skeleton is in the form of a nacreous, discoidal shell, the whorls of which are not in contact with one another, and which are divided into a series of chambers by partitions pierced by a ventral tube or *siphuncle*. The animal has minute lateral fins, and there are six rows of small suckers on the arms (see CEPHALOPODA). The three species constituting the family, or the genus, which in this case is the same, are, as designated by Prof. Owen, *spirula*, *peronii*, *S. australis*, and *S. reticulata*, and are formed from the *nautilus spirula* of Linnæus. The shell of one or other of these species is not unfrequently found on the coasts of Ireland, Cornwall, and Devon. It is commonly known as the *post-horn*, and is similar in structure to that of the nautilus, but is lodged in the posterior part of the animal, and is therefore internal, whereas the shell of the nautilus is external. It corresponds to the phragmacone of the belemnite (q.v.). The shells are found in great numbers in certain localities, but the animal has seldom been taken whole. In its internal anatomy it is a true dibranchiate, having two branchiæ and an ink-bag. It has the peculiar feature that the hinder end of the body acts as a suctorial disk for fastening itself to foreign bodies. The beaks are not calcified, and the retractor muscles of the funnel spring from the inner surface of the last chamber of the shell, as in the nautilus. This chamber also lodges the hinder termination of the liver (Owen).

SPITALFIELDS, a district of London, adjoining Bethnal Green, derives its name from the *hospital* of St. Mary, founded there, in 1197, by Walter Brune and his wife Rosia, and is inhabited chiefly by silk-weavers and other poor people. The manufacture of silk was established in Spitalfields by emigrants from France, after the revocation of the edict of Nantes.

SPITHEAD, a celebrated roadstead off Portsmouth, England, and a favorite rendezvous of the British navy, is the eastern division—the Solent (q.v.) being the western division—of that strait which separates the isle of Wight from the mainland. It receives its name from the "Spit," a sand-bank stretching s. from the English shore for 3 m., and it is 14 m. long by about 4 m. in average breadth.

SPITZ DOG, a variety of the Pomeranian dog. It is small, with a bushy curved tail, sharp muzzle, short, ovate ears, long hair of a color ranging from white to cream, and sometimes jet black. It is thought to be a cross between the arctic fox and some of the small wolf-like arctic dogs. Of late it is somewhat in disfavor, as being snappish and liable to hydrophobia; though for this the proof seems not to be supplied.

SPITZBERGEN, a group of islands in the Arctic ocean, in lat. 76° 30'—80° 40' n., and long. 10°—32° e., lies 300 m. n. of Scandinavia, and 325 e. of Greenland. The group, which is estimated to contain about 30,000 English sq. m., is composed of three large and several small islands. The largest of the group, *Spitzbergen Proper*, consists of two oblong and parallel tracts known as West Spitzbergen and East Spitzbergen or New Friesland, connected by a neck of land; the whole strongly resembling a boat hook in shape. The two next in size are *Egede* and *North-east Island*. Being far within the Arctic circle, and surrounded by a wide expanse of sea, almost the whole of its surface is covered with perpetual snow and glaciers; yet the climate is considerably milder than on the North American coast much further south—a condition due to the gulf stream. The temperature depends rather upon the winds than the season, the coldest months being February, March, and April; the mean annual temperature is about 16° below freezing, and even in July and August is seldom more than 5° above the freezing point; yet, during this short summer, more than 100 species of plants, which constitute the vegetation of this inhospitable region, succeed in springing up, and producing and ripening their seed. The whole of Spitzbergen could not afford sustenance for one human being; but it is, nevertheless, a haunt of reindeer, foxes, and bears, and whales and seals

abound on the coast. Its mountains contain granite, marble, and coal. Spitzbergen has from time to time been occupied by Dutch and Russian colonies. It was discovered in 1596, by William Barentz, the Dutch explorer, in his third voyage to discover the North-east passage, and has since been frequently visited by other explorers, and by whalers. In the summer of 1897, Andree made Spitzbergen his starting-point in an attempt to reach the north pole by balloon. See *illus.*, GLACIERS, vol. VI.

SPLAY, the sloping or beveled opening in window recesses and other such openings. Also the corner taken off the outer angle of such openings.

SPLEEN, THE, is the largest and most important of the so called ductless glands, whose chief object is supposed to be to restore to the circulation any substances that may have been withdrawn from it. It is of an oblong flattened form, soft, of very brittle consistence, highly vascular, of a dark bluish-red color, and situated on the left hypochondriac region, with its interior slightly concave surface embracing the cardiac end of the stomach and the tail of the pancreas. (See GLANDS; PANCREAS; STOMACH.) It is invested by an external or serous coat, derived from the peritoneum, and an internal fibrous elastic coat. Mr. Gray, who wrote the Astley-Cooper prize essay, *On the Structure and Use of the Spleen*, states that the size and weight of this organ are liable to very extreme variations at different periods of life, in different individuals, and in the same individual under different conditions. In the *adult*, in whom it attains its greatest size, it is usually about 5 in. in length, 3 or 4 in breadth, and an inch or an inch and a half in thickness, and weighs about 7 ounces. At *birth* its weight in proportion to that of the entire body is as 1 to 350, which is nearly the same ratio as in the adult; while in *old age* the organ decreases in weight, the ratio being as 1 to 700. The size of the spleen is increased during and after digestion, and is large in highly fed, and small in starved animals. In intermittent fevers and leucocythemia it is much enlarged, weighing occasionally from 18 to 20 lbs., and constituting what is popularly known as the *ague-cake*.

On cutting into the spleen a section of it shows the presence of numerous small fibrous bands termed *trabeculae*, united at numerous points with one another, and running in all directions. The parenchyma, or proper substance of the spleen, occupies the interspaces of the above described areolar framework, and is a soft pulpy mass of a dark reddish-brown color, consisting of colorless and colored elements. The *colorless elements* are described by Gray as consisting of granular matter, of nuclei about the size of the red blood-disks, and a few nucleated vesicles; and as constituting one-half or two-thirds of the whole substance of the pulp in well-nourished animals, while they diminish in number, and sometimes altogether disappear in starved animals. The *colored elements* consist of red blood-disks and of colored corpuscles either free or included in cells; sometimes enlarged blood-disks are seen included in a cell, but more frequently the enclosed disks are altered in form and color, as if undergoing retrograde metamorphoses. Besides these, numerous deep-red, or reddish-yellow, or black corpuscles and crystals, closely allied to the hæmatin of the blood, are seen diffused through the pulp substance.

The venous blood of the spleen is carried away by the splenic vein, which contributes to form the great portal venous system, distributed through the liver; while arterial blood is supplied by the splenic artery, the largest branch of the celiac axis. The branches of this artery subdivide and ramify like the branches of a tree, with the *malpighian* or *splenic corpuscles* attached to them like fruit. These splenic corpuscles, originally discovered by Malpighi, are whitish spherical bodies, which are either connected with the smaller arterial branches by short pedicles, or are sessile upon their sheaths. They vary considerably in size and number, their diameter usually ranging from one-third to one-sixth of a line. Each consists of a membranous capsule, homogeneous in structure, and formed by a prolongation from the sheath of the artery. The blood-vessels ramifying on the surface of a corpuscle consist of the larger branches of the artery with which it is connected, of venous branches, and of a delicate capillary plexus. From this arrangement of the vessels, it may be inferred that active changes are carried on in the contents of these corpuscles, which consist of a soft, white, semi-fluid substance, made up of granular matter, nuclei similar to those found in the pulp, and a few nucleated cells. These splenic corpuscles are much more distinct in early life than subsequently, and are much smaller in man than in most mammals. They, however, bear a remarkable relation to the general state of nutrition, being much the greatest in well-fed animals, especially in the early periods of the digestion of albuminous food; while they diminish extremely in ill-fed animals, and in those that have been starved, they disappear altogether.

The chemical composition of the spleen confirms the view that a retrograde change of tissue occurs very freely in it. In 1000 parts there were found (by Oidtmann) nearly 250 of solid residue, of which more than 243 were organic, consisting of albumen, fats, inosite, uric acid, sarcine, xanthine, leucine, tyrosine, and pigment, all of which, excepting the first two, are products of the metamorphosis of tissue. This gland also contains a large quantity of oxide of iron, obtained probably from the disintegration of red blood-disks in it.

With regard to its uses, it may be regarded as a storehouse of nutritive material, which may be drawn upon according to the requirements of the system; and of the

exertion of an assimilative action upon the albuminous matter, during its withdrawal from the general current of the circulation, we have direct evidence in the large increase in the proportion of fibrine contained in its venous blood—the blood of the splenic vein sometimes containing nearly six times the usual quantity of fibrine. Before the institution of the chemical inquiries which led to the above conclusion, it was held that the function of the organ was to act as a reservoir for the portal blood, with the view of preventing the portal vessels from being unduly distended during the digestive process. To what extent it is the seat of the disintegration of old blood-corpuscles, and of the formation of new ones, is still uncertain. The removal of this organ from the body has frequently been performed in animals without serious effects; but in some of these cases, small secondary spleens are developed, and in others, various sets of lymphatic glands are observed to increase rapidly, shortly after the operation, and these probably act vicariously for the spleen. Its singular and complicated microscopic structure, and its extreme vascularity, would lead to the inference that this is a highly important viscus.

It is unnecessary to enter into any detail regarding the diseases of the spleen, as most of them occur secondarily in the course of other affections, as in intermittent fever (ague) and leucocythemia (q.v.), when it is sometimes enlarged to 40 times its natural weight. It is sometimes diminished to the size of a walnut, the cause of this atrophy being unknown, but the apparent result being a loss of color, and a comparatively bloodless condition. The spleen is also liable to the singular morbid change known as *waxy degeneration*, in which the presence of starch like amyloid granules is observed in the tissue on submitting it to microscopico-chemical investigation. These remarkable granules dissolve when heated in water, and by the action of iodine acquire a bluish tint, but not the pure iodide of starch purple. In their ultimate composition, however, these granules resemble the albuminates rather than starch, inasmuch as they contain nitrogen.

SPLEEN WORT. See ASPLENIUM.

SPLENIC APOPLEXY, a disease of cattle and sheep, resembles black quarter (q.v.) in suddenly attacking animals in good thriving condition, and, like it, appears to depend upon the rapid manufacture of insufficiently elaborated blood, probably faulty in the healthy proportion of some of its constituents. The animal staggers, froths at mouth, throws itself about in convulsions, and sometimes dies within an hour. Few cases recover. The blood is thin, dark-colored, and indisposed to coagulate. It accumulates in the large internal organs, particularly in the liver and spleen, and is poured out on the mucous surfaces. If the animal is seen in time, and before the pulse becomes small and weak, a moderate bleeding may be tried. A full dose of physic, with a prompt stimulant, must at once be given, and cloths wrung out of hot water applied, for several hours continuously, to the belly and loins. If the animal is weak, and the pulse scarcely perceptible, stimulants must be freely given from the first; and where there is stupor, cold water likewise applied to the head. To prevent the disease, attention must be paid to regular moderate feeding; abundance of wholesome water must be supplied; the grazings not allowed to become too rank, and changed occasionally; rock-salt placed within reach; and a seton inserted in the dewlap of all cattle and sheep pastured upon lands subject to splenic apoplexy. See PASTEUR: GERM THEORY.

SPLENIZATION is a term employed in morbid anatomy to indicate a diseased condition of the lung, in which the tissue of that organ resembles that of the spleen in various physical points, such as softness, friability, etc.

SPLINT, or **SPLENT**, is a bony enlargement on the horse's leg, between the knee and fetlock, usually appearing on the inside of one or both fore-legs, frequently situated between the large and small canon bones, depending upon concussion, and most common in young horses that have been rattled rapidly along hard roads before their bones are consolidated. When of recent and rapid growth, the splint is hot and tender, and causes lameness, especially noticeable when the horse is trotted along a hard road. A piece of spongiopiline saturated with cold water should be applied to the splint, kept in position with a light linen bandage, and wetted with cold water or a refrigerant mixture every hour. Perfect rest must be enjoined for ten days or a fortnight. When the limb is cool, and free from tenderness, the swelling, which will still remain, may be greatly reduced by some stimulating applications, such as the ointment of the red iodide of mercury, the common fly blister, or the firing iron.

SPLINT-BONES. The horse and certain allied mammals have what is popularly known as an outer and an inner splint-bone in the skeleton of the leg. Beyond the bones of the carpus and tarsus, there is one very large bone (the metacarpal or metatarsus of the third toe), which supports the whole weight of the animal. On either side of this bone are the outer and inner splint-bones, which are small bones, not running more than half the length of the great central bone, into which they merge. They represent, in a rudimentary form, the metacarpal and metatarsal bones of the fourth and second toe.

SPLINTS, in surgery, are certain mechanical contrivances for keeping a fractured limb in its proper position, and for preventing any motion of the fractured ends: they are also employed for securing perfect immobility of the parts to which they are applied in other cases, as in diseased joints, after resection of joints, etc.

Ordinary splints are composed of wood carved to the shape of the limb, and padded; the best pads being made out of old blankets, which should be cut into strips long and wide enough to line the splints, and laid in sufficient number upon one another to give the requisite softness. The splints should be firmly bound to the previously bandaged limb with pieces of bandage, or with straps and buckles; care being taken that they are put on sufficiently tight to keep the parts immovable, and to prevent muscular spasm, but not so tight as to induce discomfort. Gutta percha, sole-leather, or pasteboard, after having been softened in boiling water, may in some cases advantageously take the place of wooden splints. They must be applied when soft to the part they are intended to support, so as to take a perfect mold, and then be dried, stiffened, and, if necessary, lined. An account of the more complicated kinds of splint required in certain cases, as Macintyre's splint, Liston's splint, etc., may be seen in any illustrated catalogue of surgical instruments.

The ordinary splint is now to a great degree superseded by immovable bandages, which consist of the ordinary bandage saturated with a thick mucilage of starch, or with a strong solution of a mixture of powdered gum-arabic and precipitated chalk, which, when dry, form a remarkably light but firm support. As, however, these bandages require some hours to dry and become rigid, means must be used to counteract any displacement of the limb in the interval. On this account, many surgeons prefer the plaster of Paris or gypsum bandage, which is applied in the following manner: the limb being protected by a layer of cotton-wool, a bandage composed of coarse and open material, into which as much dry powdered gypsum as possible has been rubbed, must be immersed in water for about a minute, and then rolled around the limb in a spiral manner, just as an ordinary bandage; after every second or third turn of the bandage, the left hand of the surgeon should be plunged into water, and smeared over the part last applied. When the whole has been thus treated, the exterior of the bandage should be smeared over with a paste of gypsum and water until a smooth surface and complete rigidity have been attained—a process not occupying more than 10 minutes or a quarter of an hour. In a case of simple fracture, where no surgical aid is at hand, any non-professional person of ordinary intelligence might apply this bandage, extreme care being taken that the ends of the broken bone are in their proper position.

SPLÜGEN, a mountain of the Lepontine Alps, in the Grisons, Switzerland, whose summit, 10,748 ft. high, bears the name of the Tambohorn. The pass of the Splügen, connecting the s.e. of Switzerland with the region of Italy round lake Como, is at its highest point 6940 ft. above the sea, and in its present condition is the work of the Austrian government (1821). The southern or Italian descent has three great "galleries"—i. e., covered portions of the pass constructed of solid masonry, and intended to protect the road from avalanches. They are the longest on any Alpine high-road. When Marshal Macdonald conducted the French army of reserve across the Splügen by the old path, Nov. 27-Dec. 4, 1800, he lost severely in men and horses from the fall of avalanches.

SPOFFORD, AINSWORTH R., b. N. H., 1825; was educated privately, chiefly as a classical scholar; was made an assistant librarian in the library of congress, and in 1865 became principal librarian. He had already published (1864) the *Alphabetical Catalogue of the Library of Congress*, and this was followed by supplements, the series being valuable aids to general bibliography. The library of congress, which contained 90,000 volumes in 1865, had grown in 1880 to more than 300,000, and Mr. Spofford's influence was used with successive congresses to obtain an appropriation for a building suitable for so large and increasing a collection. In this he was measurably successful, and a commodious and appropriate structure will probably be erected. Mr. Spofford is recognized as a bibliographer of erudition and remarkable natural gifts, adapting him for the responsible position of librarian in the national library. Besides his work in cataloguing, he has published the *American Almanac*, 1878-91; a comprehensive storehouse of chronology and facts in finance and politics.

SPOFFORD, HARRIET ELIZABETH (PRESCOTT), b. Me., 1835; received her education at Newburyport, Mass., and in 1865 married Richard S. Spofford, a lawyer of Boston. She has been a frequent contributor to the *Atlantic Monthly*, *Harper's Monthly*, and other periodicals. She wrote *Str Rohan's Ghost* (1859); *The Amber Gods, and Other Stories* (1863); *Azarian, an Episode* (1864); *New England Legends* (1871); and *The Thief in the Night* (1872); *Scarlet Poppy and Other Stories* (1894); *A Master Spirit* (1896).

SPOHR, LUDWIG, an eminent German musical composer and violinist, son of a physician of Brunswick, was b. in that town in 1784. He began his violin studies in boyhood; at the age of 12 he played a violin concerto of his own at the court of Brunswick; and at 13 he obtained an appointment as chamber-musician to the duke. A few years later he made a musical tour through Russia and Germany, giving concerts, and acquiring a high reputation as a performer on the violin. In 1805 he became music director at the court of Saxe-Gotha, and held afterward for several years the office of music director of the Theater an der Wien at Vienna. He visited Italy in 1817. Paris in 1819, and in 1820 appeared in London, where he was received with great applause at the Philharmonic society's concerts, and produced two symphonies and an overture. In 1822 he became kapellmeister at the court of Hesse-Cassel, which post he continued to

hold till 1857, when he retired from professional life. He died in 1859. Spohr's musical works include seven operas—*Faust*, *Jessonda*, *Zemira und Azor*, *Der Zweikampf der Geliebten*, *Der Berggeist*, *Peter von Albano*, and *Der Alchymist*; three oratorios, *Die letzten Dinge*, *Des Heiland's letzte Stunden* (Calvary), and *Der Fall Babylons*; various masses, psalms, and hymns, six grand symphonies, four overtures, besides nonets, quartets, violin concertos, sonatas for violin and harp, fantasias, and rondos. *Die letzten Dinge*, or Last Judgment, is a very grand and very attractive work; so also is *Der Fall Babylons*, first produced at a Norwich musical festival. Of his operas the most esteemed are *Faust* and *Jessonda*, the latter remarkable for its successful embodiment of the spirit of oriental poetry. His songs are rather deficient in broad and decided melody; but his instrumental works occupy a very high place in the estimation of musicians, more especially the C minor symphony, and the symphony known as *Die Weihe der Töne*. His *Violinschule* is a complete work on violin playing.

SPOKANE, a co. in n.e. Washington, formed 1879, from part of Stevens co.; 1680 sq. m.; pop. '90, 37,487. Co. seat, Spokane.

SPOKANE, city and co. seat of Spokane co., Wash.; on the Spokane river and the Great Northern, the Northern Pacific, the Oregon Railroad and Navigation Co.'s line, and the Spokane Falls and Northern railroads. It is at the cascades of the river, which here has a fall of over 150 feet, and furnishes power for manufacturing and for electric railroads, as well as the water supply of the city. The city is the seat of a Protestant Episcopal bishopric, and of fort Spokane, a U. S. military post. It has a city hall, co. court house, Gonzaga college (R. C.), academy of the Holy Names (R. C.), St. Mary's hall (P. E.), public library, Sacred Heart hospital, St. Joseph's orphanage, deaconess home, home of the friendless, 12 bridges, including a cantilever 1500 ft. long, electric lights, national and private banks, over 60 churches, and daily, weekly, and monthly periodicals. The principal industries are mining, milling, lumbering, manufacturing, and farming. Pop. '90, 19,992.

SPOLETO (Latin, *Spolegium*), a city of central Italy, province of Perugia, is situated on a rocky hill, 61 m. n.n.e. of Rome. Pop. '81, 7696. It is commanded by a citadel, *La Rocca* (now a prison), which in 1499 was inhabited by Lucretia Borgia. The streets are steep, narrow, and dirty. The town is united with the neighboring height of *Monte Luco* by an imposing bridge and aqueduct, 290 ft. in height, dating from Roman times, but restored in 14th c. Spoleto has a fine cathedral, built in the time of the Lombard dukes, and several interesting churches and palaces.

SPONGE, *Spongia*, a genus which originally included all the numerous genera and species of the family *spongiade*, all of which are still commonly spoken of by naturalists as sponges, although in its more popular sense that term is limited to a few kinds, or to their fibrous framework. The sponges are creatures of very low organization, concerning which there has been much difference of opinion, whether they ought to be referred to the animal or to the vegetable kingdom. At first referred to the *Protozoa*, and later to the *Calenterata* (see ZOOLOGY), they are now considered by the greater number of naturalists as entitled to rank as a separate sub-kingdom, *Porifera*, characterized by the multitude of mouths or inhalent apertures which open through the body wall, the primitive mouth of the two-layered sac-like embryo being converted into the large exhalent opening. They may be classified as follows: 1. *Myxospongiae*, destitute of skeleton; 2. *Fibro-spongiae*, having a fibrous skeleton, with or without siliceous spicules; 3. *Calcspongiae*, having calcareous spicules. These spicules are not purely natural or mineral, but contain a trace of organic or animal matter, by the growth of which their form is determined upon. They are most beautiful microscopic objects, and spicules of different forms are sometimes found in the same species, sometimes lying close together in bundles, sometimes straight or slightly curved, sometimes in the shape of needles pointed at one end, or at both; sometimes of needles radiating from a center; while some have a head at one end like a pin, some have grapnel-like hooks at the ends. Some of the species with horny framework have spicules imbedded in it; some have them implanted in the fibers; some are destitute of them. There is a beautiful West Indian species, *dictyocalyx pumiceus*, in which the siliceous matter becomes itself a fibrous network, and is so fine and transparent as to resemble spun glass. In a living state many sponges exhibit lively colors, from the presence of some coloring matter, or from iridescence. Like the higher animals, the body of the sponge is composed of a distinct outer layer of cells, the ectoderm or epidermis, and a ciliated inner layer or endoderm (often restricted to definite areas, the so-called ciliated chambers), between which a middle layer of cells, the mesoderm, arises. This may be of very variable thickness, and gives rise to the skeleton. From the close resemblance which the cells of the ectoderm and mesoderm present to *Amoeba*, and those of the endoderm to those infusoria known as *Monads*, it has been argued that the sponge is a mere colony of *Protozoa*. But its development accords too closely with that of higher animals to admit of such a view, a free-swimming ciliated larva being produced by segmentation of a fertilized ovum. In the sponge, however, we have a degree of independence of the cell units far greater than that which exists in any other group—a divided sponge readily reunites and adjacent masses grow together. They assume very various forms, which are characteristic of the different genera and species. Some are nearly globular; some cup-shaped, top-shaped, conical, cylindrical, thread-like, etc.; some are simple, and some branched.

The surface of a living sponge is generally covered with minute pores, through which

water is imbibed, carrying with it both the air and the organic particles necessary for the support of life. The pores are supposed to be permanent in many of the sponges, and the currents which enter through them to be produced by cilia, although these have as yet been detected only in a few species. But in those of the very lowest organization the pores seem to be formed for the occasion, just as the *amœba* opens anywhere to admit food within its substance. In *spongilla fluviatilis*, a small fresh-water species found in Britain, the opening and closing of each pore occupies less than a minute, and the pores do not open simultaneously, but in irregular succession, and apparently never again in precisely the same spot. No trace of the pore remains for an instant after its closing, nor is there any indication of the point where a new one is to open. The water which enters by the pores passes out of some sponges by a single orifice, which serves for the whole mass; others have numerous orifices (*oscula*) which are permanent, and are much larger than the pores by which the water is imbibed, the whole mass being pervaded by canals which lead from the pores to these orifices, from which, under the microscope, a constant discharge of water may be seen taking place, minute opaque particles being carried along with its current. These particles are not only fecal matter, but gemmules and ova.

Reproduction takes place both by gemmation and by true ova. Many of the gemmules go on to increase the sponge-mass; but the greater part finally become detached, and are carried out into the water to settle down in a new locality. Mr. Huxley has detected true ova and sperm-cells imbedded in the substance of sponges.

The sponges employed for domestic and other purposes derive their value from the elasticity and compressibility of their fibrous framework, divested of the gairy substance, and its power of imbibing fluids. The absence of spicules is essential to a useful sponge. The kinds fit for use are found in the seas of warm climates. Some small species of sponge live at great depths. One has been brought up in the gulf of Macri from a depth of 185 fathoms. Numerous species of sponge are very abundant on many parts of the British coasts.

Fossil remains of sponges are found in many rocks, and of horny, fibrous kinds, as well as of those with calcareous or siliceous framework.

Several species of sponge are in use for economical purposes. Two species are chiefly brought from the Levant, and a very inferior one from the West Indies and coast of Florida. The trade in sponge is very considerable; is carried on chiefly by the Turks and the inhabitants of the Bahama islands. The number of men employed in the Ottoman sponge-fishery is between 4,000 and 5,000, forming the crews of about 600 boats. These boats find their chief employment on the coast of Candia, Barbary, and Syria. The sponge is obtained by diving, the diver taking down with him a flat piece of stone of a triangular shape, with a hole drilled through one of its corners; to this a cord from the boat is attached, and the diver makes it serve to guide him to particular spots. When he reaches the growing sponges, he tears them off the rocks, and places them under his arms; he then pulls at the rope, which gives the signal to his companions in the boat to haul him up. The value of sponges collected in Greece and Turkey is from \$450,000 to \$500,000 annually. The Greeks of the Morea, instead of diving, obtain sponges by a pronged instrument; but the sponges thus collected are torn, and sell at a low price. The best sponges are obtained on detached heads of rock in 8 or 10 fathoms of water.

The sponges of the Bahamas and other West Indian islands are of a larger size and coarser quality; but large quantities are gathered; and about 215,000 lbs., worth £17,000, are sent annually to Great Britain. The sponges are torn from the rocks by a fork at the end of a long pole. To get quit of the animal matter they are buried for some days in the sand and then soaked and washed.

The domestic uses of sponge are familiar to every one. It is also of great value to the surgeon, not only for removing blood in operations, but for checking hemorrhage. Burnt sponge was once a valid remedy for scrofulous diseases and goiter; but iodine and bromine, from which it derives all its value, are now administered in other forms.

SPONSOR (Lat. one who promises), the name given in theological use to a godfather or godmother (q. v.). The name is derived from the circumstance, that in baptism or confirmation, and especially in infant baptism, the sponsor is understood to make certain promises or engagements in the name and on the part of the person baptized or confirmed. The idea of sponsorship is entirely rejected not only by Baptists, but generally also by Presbyterians and Independents.

SPONTANEITY, the name for the doctrine, referring to the human mind, that muscular action may, and does, arise from purely internal causes, and independent of the stimulus of sensations. It had long been the tacit assumption in mental philosophy, that we are never moved to action of any kind, except under the stimulation of some feeling, some pleasure or pain, or some end in view. To this is now opposed the doctrine of the spontaneous commencement of movements under certain circumstances; which, however, does not exclude, but only supplements, the operation of the feelings in stimulating movements, as in the ordinary course of voluntary action. The doctrine supposes that the nerve-centers, after repose and nourishment, acquire a fullness of vital energy, which discharges itself in the play of movement, without any other occasion or

motive; the addition of a feeling, or end, enhances and directs the activity, but does not wholly create it.

Of the various proofs and illustrations of spontaneity, perhaps the most striking is that furnished by the movements of young animals of the active species. A young dog or kitten shows a degree of activity out of all proportion to any feeling to be gratified, or any end to be served; we can interpret it only as internal energy seeking vent, irrespective of the pursuit of pleasure or the avoidance of pain—in other words, the action of the will. When the accumulated energy is expended, the animal falls back into a state of repose, and is then roused only by the stimulus of sensation. The state called “freshness” in a horse, for example, is a state of superabundant and irrepressible activity. Children go through the same phase: after rest or confinement, they burst forth incontinently into some form of active excitement, of which a part may be considered as pure spontaneity, while part may be owing to sensation.

The doctrine is well fitted to express the difference between the active and the sensitive temperaments: for if it were true that actions is in proportion to the stimulation of the feelings, the most susceptible characters would be the most active. But, in point of fact, the active temperament is manifested by a profusion of activity for its own sake, with little circumspection or regard to consequences; and constitutes the restless, bustling, roughshod, energetic, and enterprising disposition of mind, as seen in sportsmen, soldiers, travelers, etc.

The explanation of the growth of the will (q.v.), or voluntary power, involves the spontaneous beginning of movements.—See Bain on *The Senses and the Intellect*, 2d edit., p. 76.

SPONTANEOUS COMBUSTION is a phenomenon that occasionally manifests itself in mineral and organic substances. The facts connected with the spontaneous ignition of mineral substances are well known to chemists, and some of them have been already described in the article *Pyrophorus* (q.v.). Ordinary charcoal does not undergo combustion in air under a temperature of 1000°, but in some states it is liable spontaneously to acquire a temperature which may lead to unexpected combustion. Thus, lamp-black impregnated with oils, which contain a large proportion of hydrogen, gradually becomes warm, and inflames spontaneously. According to M. Aubert, Chevallier, and other French observers, recently-made charcoal, in a state of fine division, is liable to be spontaneously ignited without the agency of oil; but we are not aware that this phenomenon has been observed in this country. There have been many instances of the spontaneous ignition of coals containing iron pyrites (q.v.) when moistened with water. The pyrites which most readily give rise to spontaneous combustion are those in which the protosulphide is associated with the bisulphide of iron; and these occur in the Yorkshire coals from Hull, and in some kinds of South Wales coal. Sulphur has no tendency to spontaneous combustion, but Dr. Taylor refers to an instance that came to his own knowledge, in which there was reason to believe that the vapor of bisulphide of carbon in an india-rubber factory was ignited by solar heat traversing glass. Phosphorus, when in a dry state, has a great tendency to ignite spontaneously, and it has been observed to melt and take fire (when touched) in a room in which the temperature was under 70°. The ordinary lucifer-match composition is luminous in the dark, in warm summer nights, which shows that oxidation, and therefore a process of heating, is going on. Hence, large quantities of these matches kept in contact may produce a heat sufficient for their ignition. “I have seen them ignite,” says Dr. Taylor, “as a result of exposure to the sun’s rays for the purpose of drying.”—*Principles and Practice of Medical Jurisprudence*, 1865, p. 603.

From these cases occurring in the mineral kingdom, we pass to the consideration of spontaneous combustion in organic substances. Passing over the accidents that may result from the admixture of strong nitric or sulphuric acid with wool, straw, or certain essential oils, and which, if they occur, are immediate and obvious, we have to consider the cases in which, “without contact with any energetical chemical compounds, certain substances—such as hay, cotton, and woody fiber generally, including tow, flax, hemp, jute, rags, leaves, spent tan, cocoa-nut fiber, straw in manure-heaps, etc.—when stacked in large quantities in a damp state, undergo a process of heating from simple oxidation (eremacausis) or fermentation, and, after a time, may pass into a state of spontaneous combustion.”—Taylor, *op. cit.*, p. 606. There is undoubted evidence that hay and cotton in a damp state will occasionally take fire without any external source of ignition. Cotton impregnated with oil, when collected in large quantity, is especially liable to ignite spontaneously; and the accumulation of cotton-waste, used in wiping lamps and the oiled surfaces of machinery, has more than once given rise to accidents, and led to unfounded charges of incendiarism. Dr. Taylor relates a case in which a fire took place in a shop “by reason of a quantity of oil having been spilled on dry sawdust.” According to Chevallier, vegetables boiled in oil furnish a residue which is liable to spontaneous ignition; and the same chemist observes that all kinds of woollen articles imbued with oil, and collected in a heap, and hemp, tow, and flax, when similarly treated, may ignite spontaneously. In the case of *Hepburn v. Lordan*, which came before vice-chancellor Wood in Jan., 1865, and was carried by appeal before the lords justices in the following month, an attempt was made to prove that wet jute was liable to undergo spontaneous

combustion: and the great fire at London Bridge in 1861 was referred to the spontaneous combustion of jute in its ordinary state. With regard to the latter hypothesis, Dr. Taylor remarks that it is wholly incredible, and from experiments which he made for the defendants in the above lawsuit, and on other grounds, he holds that there is no evidence of moist jute undergoing spontaneous combustion; but, he adds, although no cases are recorded, it is probable that jute, cocoa-nut fiber, and linen and cotton rags, imbued with oil, might undergo this change. Dry wood is supposed by Chevallier and some other chemists to have the property of igniting spontaneously. Deal which has been dried by contact or contiguity with flues or pipes conveying hot water or steam at 212° , is supposed to be in a condition for bursting into flame when air gets access to it; and the destruction of the houses of parliament, and many other great fires, have been ascribed to this cause; but from the experience of Dr. Taylor (*op. cit.*, p. 615) this view must be regarded as untenable.

It is still an open question whether such organic nitrogenous matters as damp grain or seeds of any kind ever undergo spontaneous combustion. In a case recorded in the *Annales d'Hygiène* for 1841, MM. Chevallier, Ollivier, and Devergie drew the conclusion that a barn had caught fire from the spontaneous combustion of damp oats which were stored in it. No such cases are known to have occurred in this country.

The subject of the article is of extreme importance, not only because it may cause great destruction of life and property, but because it may lead to unjust charges of incendiarism.—For further details regarding it the reader is referred to Graham's "Report on the Cause of the Fire in the Amazon," in the *Quarterly Journal of the Chemical Society*, vol. v. p. 34; to the article "Combustion" in *Watts's Dictionary of Chemistry*, vol. i.; and to the elaborate chapter on this subject in Taylor's *Principles and Practice of Medical Jurisprudence*.

SPONTANEOUS COMBUSTION OF THE HUMAN BODY. In medico-legal works, cases are recorded, generally of a somewhat ancient date, in which it was supposed that the body was either spontaneously consumed by inward combustion, or acquired such extraordinary combustible properties as to be consumed when brought into contact with fire. The following is the first of one of the cases on record. It rests on the authority of Le Cat, a distinguished surgeon of his time, and is stated to have occurred at Rheims in 1725. The remains of a woman named Millet were found burned in her kitchen, about eighteen inches from the open fireplace. Nothing was left of the body except some parts of the head, of the legs, and of the vertebræ. Suspicion was excited against the husband, and a criminal inquiry was instituted; but learned experts reported that the case was one of spontaneous combustion, and the prisoner was acquitted. The facts are explicable on the supposition that the clothes of the deceased woman were accidentally ignited; and although the almost complete destruction of the body appeared to the medical men of that time to be inconsistent with the ordinary effects of fire, subsequent observations have shown that this is an error. In reference to this case, Liebig observes that it is easy to see that the idea of spontaneous combustion arose at a time when men entertained entirely false views on the subject of combustion, its essence, and its cause. What takes place in combustion generally has only been known since the time of Lavoisier (about a century ago), and the conditions which must be combined in order that a body should continue to burn, have only been known since the time of Davy, or for little more than half a century. From the time when the case of Millet occurred to the present day, probably somewhat over 50 supposed cases have been recorded. (In an article published on the subject by Dr. Frank of Berlin in 1843, 45 cases are adduced.) From an analysis of all the cases on record up to 1851, Liebig arrives at the conclusion that the great majority agree in the following points. "1. They took place in winter. 2. The victims were brandy-drinkers in a state of intoxication. 3. They happened where the rooms are heated by fires in open fireplaces and by pans of glowing charcoal, in England, France, and Italy. In Germany and Russia, where rooms are heated by means of closed stoves, cases of death ascribed to spontaneous combustion are exceedingly rare. 4. It is admitted that no one has ever been present during the combustion. 5. None of the physicians who collected the cases, or attempted to explain them, has ever observed the process, or ascertained what preceded the combustion. 6. It is also unknown how much time had elapsed from the commencement of the combustion to the moment when the consumed body was found."—*Letters on Chemistry*, 3d ed. 1851, p. 282. Out of the 45 cases collected by Frank, there are only three in regard to which it is assumed that combustion took place when no fire was in the neighborhood; and Liebig distinctly shows that these three solitary cases are totally unworthy of belief. With regard to the other cases, the writers who record them do not deny the presence of fire, but assume that the body was ignited by the fire, and then burned on like a candle or a bundle of straw, under similar conditions, till nothing but ashes or charcoal was left. These writers maintain that excess of fat, and the presence of brandy in the body, induce an abnormal condition of easy combustibility; but Liebig shows, by numerous illustrations, the utter fallacy of this view; and adds, as further evidence, "the fact that hundreds of fat, well-fed brandy-drinkers do not burn when by accident or design they come too near a fire. It may with certainty be predicted that, so long as the circulation continues, their bodies would not take fire, even if they held a hand in the fire till it was charred."—Spontaneous combustion in a living body is (he

adds) absolutely impossible. Notwithstanding the wide promulgation of Liebig's views, the belief in the possible occurrence of spontaneous combustion seems not yet to have disappeared. In 1847 the body of a man, aged 71, and who was neither fat nor a drunkard, was found in bed in a state of combustion. Dr. Nasson, who was commissioned to investigate the case, reported that the burning must have resulted from some inherent cause in the person—probably roused into activity by a hot brick that was placed at his feet; and Orfila is reported to have coincided in this opinion. This case is reported in the *Gazette Médicale*, Sept. 4, 1847. On June 13, 1847, the countess of Goerlitz was found dead in her bedroom, with the upper part of her body partly consumed by fire. The head was a nearly shapeless black mass, with the charred tongue protruding from it. The physician who was consulted could suggest no other explanation than that the body of the countess must have taken fire spontaneously, and not even by ignition of her dress by a candle. On this evidence she was buried; but circumstances having led to the suspicion that she had been murdered by her valet Stauff (who had been detected in attempting to poison the count), her body was exhumed in Aug., 1848, fourteen months after her death, and was subjected to a special examination by the Hesse medical college, who reported that she had not died from spontaneous combustion. The case was then referred to Liebig and Bischoff, and their report was issued in Mar., 1850, when Stauff was put upon his trial. They found no difficulty in concluding that the body was wilfully burned *after death*, for the purpose of concealing the murder (either by strangulation or a blow on the head) which had been previously perpetrated. The prisoner was convicted, and subsequently confessed that he had committed the murder by strangulation, as indeed the protruded tongue might have suggested. Since that date there has not been any case of alleged spontaneous combustion.—On this subject the reader is referred to the various articles on "Spontaneous Combustion" in the medical dictionaries and encyclopædias; to Dupuytren's *Leçons Orales*; to Liebig's *Letters on Chemistry*; and to Taylor's *Medical Jurisprudence*.

SPONTANEOUS GENERATION. See GENERATION, SPONTANEOUS.

SPONTOON, a weapon bearing resemblance to a halberd, which, prior to 1787, was borne instead of a half-pike by officers of British infantry. It was a medium for signaling orders to the regiment. The spontoon planted in the ground commanded a halt; pointed backward or forward, advance or retreat; and so on.

SPOOL, in spinning, a wooden reel for winding yarn upon. In sewing and lace-making machines, the spools are of metal, and their forms vary according to the requirements of the machine.

SPOONBILL, *Platalea*, a genus of birds of the Heron family (*Ardeidae*), much resembling storks both in their structure and their habits, but distinguished by the remarkable form of the bill, which is long, flat, broad throughout its whole length, and much dilated in a spoon-like form at the tip. The species are not numerous, but are widely distributed. The only European species is the WHITE SPOONBILL (*P. leucorodia*), rare in Britain, although in former times, before the draining of the fens in England, it was a more frequent summer visitor. It is common in Holland, in marshy districts throughout the northern parts of Europe and Asia in summer, and in the salt marshes of the coast of Italy in winter. It also inhabits Africa, and its range extends over the whole of that continent. It is gregarious, and the flocks of spoonbills generally make their nests in woods, in the tops of lofty trees. It is considerably smaller than the common heron. Its color is white, slightly tinged with pink; the bill and legs are black. A curious convolution of the windpipe, in the form of the figure 8, is found on dissection in the adult spoonbill, but does not exist in the young. The flesh of the spoonbill is said to be tender and of good flavor. The spoonbill is easily tamed, is quiet and inoffensive, feeds readily on any offal.—The ROSEATE SPOONBILL (*P. ajaja*) is an American species; very abundant within the tropics, and found in the most southern parts of the United States. It is nearly equal in size to the white spoonbill, which it resembles in its habits. It is a beautiful bird, with plumage of a fine rose-color, of which the tint is deepest on the wings; the tail-coverts crimson.

SPO'RADES. See ARCHIPELAGO.

SPORADIC (Gr. scattered) is a term applied to any disease that is naturally epidemic or contagious, when it attacks only a few persons in a district, and does not spread in its ordinary manner. The conditions on which the occurrence of epidemic or contagious diseases in a sporadic form depend are unknown. Among the diseases which occur in this form may be especially mentioned catarrh, cholera, dysentery, measles, scarlatina, and small-pox.

SPORE, in botany, may be called the *seed* of a cryptogamous plant, as it serves the same purpose of reproduction as the seed of a phanerogamous or flowering plant, and after remaining for a time in a state of rest, is developed into a new plant on the occurrence of the necessary conditions. A spore, however, differs very much from the seed of a phanerogamous plant, as it always consists of a single cell, and therefore does not con-

tain any *embryo* or rudiment of the future plant. In its formation, it corresponds rather with the grains of pollen in the anther of a flower. Spores are small, often so minute as to be invisible to the naked eye—many of them extremely minute, so that they may be wafted about unperceived. This, indeed, might be expected from the very small size of many of the cryptogamic plants themselves, as moulds and many other fungi. But even the spores of the largest ferns are very small. Spores often remain capable of germination for many years, and they seem to be capable of enduring much drought without destruction. They seem to germinate indifferently from any part of their surface, in which they differ essentially from the seeds of phanerogamous plants. In the parent plant, they are either scattered singly, or are united in a fruit-like envelope, which is generally known as a *sporangium*, or *spore-case*. In some plants they are united in definite numbers, as of four (*tetraspore*), surrounded by an envelope (*perispore*, or *sporidium*). The peculiar reproductive organ, which in some cryptogamous plants produces the spores, is called a *sporocarp*, or a *sporophore*. In many plants, as in mushrooms, the production of spores belongs exclusively to a part of the plant called the *hymenium*. See *illus.*, LYCOPODIACEÆ, vol. IX.

SPORTS, BOOK OF, the name popularly given to a declaration issued by James I. of England in 1618, to signify his pleasure that on Sundays, after divine service, "no lawful recreation should be barred to his good people, which should not tend to the breach of the laws of his kingdom and the canons of his church." The sports specified were dancing, archery, leaping, vaulting, May-games, Whitsunales, morrice-dances, and the setting up of May poles. The occasion of this proclamation was the conduct of some Puritan authorities in Lancashire, who, in illegally suppressing, instead of regulating, the customary recreations of the common people, had excited much discontent, and increased the influence of the Roman Catholics by giving a repulsive aspect to the reformed religion. Although the declaration was ordered to be read in the parish churches of the diocese of Chester, this order was not enforced, and the king's design was allowed to drop. Among the excepted unlawful sports were bear-baiting, bull-baiting, bowling, and interludes. Non-conformists and others not attending divine service at church were prohibited from joining in the sports, nor was any one allowed to go out of his own parish for that purpose, or to carry offensive weapons. By republishing this declaration in 1633, and enforcing with great severity the reading of it by the clergy in their churches (see **SABBATH**), Charles I. and Laud excited among the Puritans a degree of indignation which contributed not a little to the downfall of the monarchy and the church. In 1644 the long parliament ordered all copies of it to be called in and publicly burned.—Heylin's *Hist. of the Sabbath and Life of Laud*, Fuller's *Church History*, D'Israeli's *Life of James I.*, Southey's *Book of the Church*, Hallam's *Constitutional History of England*, and Cox's *Literature of the Sabbath Question*.

SPOTSWOOD, ALEXANDER, 1676-1740 ; b. Tangier, Africa ; a soldier of the British army; he served with Marlborough, was wounded at Blenheim. He was governor of Virginia, 1710-22; deputy postmaster-general, 1730; and in 1739 commander of the forces to be sent into Florida. He was active in promoting the cause of education, and especially solicitous for the interests of William and Mary college. He was also interested in the improvement of the condition of the Indian race. It is to his efforts that the improvement in the production of tobacco is attributable, and he favored the act for making tobacco-notes a circulating medium. He introduced the manufacture of iron into Virginia, and explored the Appalachian range of mountains.

SPOTTED-FEVER. See **MENINGITIS**.

SPOTTISWOOD, JOHN, Archbishop of St. Andrews, son of John Spottiswood, superintendent of Lothian, was born in the year 1565. He was educated at the university of Glasgow, and on his father's death, succeeded him as parson of Calder. In 1601, he attended the duke of Lennox as chaplain, when that nobleman was sent as ambassador to France by King James VI. When James succeeded to the English crown, Spottiswood accompanied him on his journey to London, and, soon after that event, on the death of Archbishop James Beaton, was appointed to the see of Glasgow. He was chosen moderator of the general assembly of the Scottish church, which met at Glasgow in 1610, and completed the establishment of episcopal government, which James had labored so long to accomplish. In October of that year, he was along with the bishops of Brechin and Galloway, consecrated at London House by the bishop of London and other English prelates. In 1615, he took a leading part in the examination of John Ogilvie, a Jesuit priest, who was apprehended at Glasgow, and hanged for refusing to disown the temporal power of the pope. The share he took in this matter was most discreditable to the archbishop. In the course of the same year, he was translated to the see of St. Andrews. As primate of the Scottish church, Spottiswood had now the chief management of ecclesiastical affairs, and great influence also in the civil government, and his rule was marked by uniform ability, and, with rare exceptions, by prudence and moderation. He presided at the assembly which met at Perth in 1618, and sanctioned the five points of ecclesiastical discipline known as the Perth articles. He was as much in favor with King Charles I. as he had been with King James, and at the coronation of that sovereign at Holyrood in 1633, he placed the crown on his head

and anointed him. In 1635, Spottiswood was made chancellor of Scotland, a dignity which no churchman had held since the Reformation; but in accepting an appointment so invidious to the nobles, he did not act with his usual discretion. He reluctantly entered into the king's unwise measures for the introduction of a liturgy into Scotland, and became one of the chief objects of popular dislike when the covenanters acquired the ascendancy. He soon found it necessary for his safety to retire to England, and at the end of 1638, at the king's request, he resigned the chancellorship. He protested against the lawfulness of the general assembly which met at Glasgow in November of the same year, and was deposed and excommunicated by that body for alleged offenses, which, so far as his private character was concerned, were improbable in themselves, and supported by no evidence whatever. The archbishop did not long survive the overthrow of the polity which it had been the work of his life to build up. He died at London, Nov. 26, 1639, being then in the 74th year of his age. He had expressed a wish to be buried at Dairsie in Fife, where he had rebuilt the church after the English model, but this was found impracticable, and he was interred in Westminster Abbey. The writings of Spottiswood are his well-known *History of the Church of Scotland*, first published in 1655; a sermon preached at the meeting of the Perth assembly of 1618, which was published by bishop Lindsay in 1621 in his account of the proceedings of that assembly; and a Latin treatise, *Refutatio Libelli de Regimine Ecclesie Scoticanæ*, written in answer to a tract of Calderwood's, and published in 1620. The chief authorities for the biography of the archbishop are the life ascribed to bishop Duppa, prefixed to the folio editions of his *History*, and the life by bishop Russell, prefixed to the Spottiswood society edition of the same work.

SPOTTISWOODE, WILLIAM, 1825-1883; b. and d. London. He graduated at Oxford, 1847; distinguished as a mathematician and as an oriental scholar. He traveled in E. Russia, 1856, and published an account of his travels, and a number of papers upon mathematical and scientific subjects. He was pres. of the London royal soc.

SPOTTSYLVANIA, a co. in n.e. Virginia, intersected by the Richmond, Fredericksburg and Potomac, and the Potomac, Fredericksburg and Piedmont railroads; 400 sq.m.; pop. '90, 14,233, chiefly of American birth. Co. seat, Spottsylvania.

SPOTTSYLVANIA COURT-HOUSE—BATTLES. See WILDERNESS.

SPRAGUE, CHARLES, 1791-1875; b. Mass.; leaving school at an early age became merchant's clerk, and in 1816 a partner; teller in State bank, 1820; cashier of Globe Bank, 1825-65; received, 1821, the prize for the best prologue at the opening of Park Theatre, New York; afterwards prize for the five best poems for the American stage; wrote prize ode for the pageant in honor of Shakespeare at Boston Theatre, 1823; was a member of the city council, and delivered the oration, July 4, 1825; gave an address on temperance, 1827; the Phi Beta Kappa poem, *Curiosity*, at Cambridge, 1829; an ode at centennial celebration of settlement of Boston, 1830. Among his best pieces are *Ode on Shakespeare* and *Winged Worshipers*. An edition of his poems and prose writings appeared in 1855.

SPRAGUE, WILLIAM, 1799-1856; b. R. I.; elected to the state assembly at an early age, and its speaker in 1832. He was a member of congress 1835-37 and U. S. senator 1842-44. He was an extensive manufacturer of cotton.

SPRAGUE, WILLIAM, b. R. I., 1830; succeeded to his father's immense business in the manufacture of calico prints. He was governor of Rhode Island, 1860-63, took part in the war of the secession, and was U. S. senator from Rhode Island, 1863-75. He married a daughter of Chief-justice Chase.

SPRAGUE, WILLIAM BUELL, D.D., 1795-1876; b. Conn.; graduated at Yale college, 1815; private tutor in Virginia, 1815-16; studied at Princeton college and was settled over the First church (Congregational), West Springfield, Mass., as colleague pastor, 1819, and as pastor, 1821; pastor of Second Presbyterian church, Albany, 1829-69; resided at Flushing, L. I., from 1869 until his death. Published numerous sermons and addresses: *Letters to a Daughter*; *Lectures to Young People*; *Letters from Europe*; *Life of Edward Dorr Griffin*; *Life of Timothy Dwight*; *Lectures on Revivals*; *Hints on the Intercourse of Christians*; *Women of the Bible*; *Visits to European Celebrities*; *Annals of the American Pulpit*, 9 vols., a work of great research. He contributed to the biographical department of *Appleton's Cyclopædia*.

SPRAIN. A sprain or strain is a term employed in surgery to designate a violent stretching of tendinous or ligamentous parts with or without rupture of some of their fibers. Sprains are very frequent in all the joints of the upper limbs, especially in the wrist and the articulations of the thumb. In the lower extremity the ankle is the joint by far the most frequently affected; and this is accounted for anatomically by the small size of the articular surfaces, the great weight the astragalus (the bone presenting the lower articular surface) has to support, and the unyielding nature of the lateral ligaments. In slight sprains of this joint the ligaments are only stretched or slightly lacerated, but in more severe cases they may be completely torn through. Sprains of the ankle are sometimes mistaken for fractures, and *vice versa*; and the two

injuries may co-exist. The pain and swelling sometimes make an accurate diagnosis difficult, especially if the patient is not seen for some time after the accident; and if any doubt exists, the case should be treated as for the more severe injury, since it is better that the treatment should be prolonged than that the patient should be maimed; and, fortunately, that which is the proper treatment of a fracture is the best that can be employed for a sprain. Sprains of the knee are not uncommon, and are characterized by great swelling from effusion of fluid within the joint. Sprains of the back are not unfrequent accidents, and are the most serious of any, but in most cases it may be anticipated that after confinement in bed or on a sofa for two or three weeks, and with proper treatment, the patient will be able to walk, although he may feel stiffness and pain for several weeks longer. The treatment of sprains generally must be regulated by their severity. In a severe sprain, attended with much pain and inflammation, leeches should be applied, followed by hot-water fomentations, or the application of a hot linseed-meal poultice. In slighter cases, rest and cold lotions constitute sufficient treatment. In all cases of sprain of the extremities, thin pasteboard splints placed on the outer and inner surfaces of the joint, over a wet bandage previously laid round it, afford support to the part and comfort to the patient. In sprains of the back, more decided antiphlogistic or lowering measures are required. "After an active mercurial purge, a dose or two of Dover's powder may be given, with salines at intervals. The diet ought to be spare. In those of vigorous constitution the abstraction of blood may be required. Afterward, nothing will conduce more to the comfort of the patient than well-managed fomentation of the back. Amendment will be denoted by the patient's turning in bed more freely, and seeking to sit up. At that period stimulating liniments, or the application of the compound tincture of iodine, will be called for. When able to walk, he will be benefited by a warm plaster to his loins."—Shaw on "Injuries of the Back," in Holmes's *System of Surgery*, vol. ii. p. 202.

SPRAINS, or STRAINS, are very common among horses, owing to the severe exertions required of them, often while they are young, and unprepared for such work. Various muscles, ligaments, and tendons are liable to strain, but none more frequently than the large tendons passing down the back of the fore-limbs. In slight cases, cold water continuously applied for several hours gives relief; but in all serious cases, diligent fomentation with water about the temperature of 100° is preferable; or the injured part may be swathed in a thick woolen rug, kept constantly moist and warm by frequent wetting with the hot water. Perfect rest is essential, and in order to insure the relaxation of the large tendons of the horse's limbs, he may in bad cases be kept slung for several days. Blisters, hot oils, firing, and all such irritants, are on no account to be used until the inflammation abates, and the part becomes cool, and free from tenderness. Such remedies are then useful for causing the re-absorption of swelling, and perhaps also for invigorating the weakened part.

SPRAT, *Harengula sprattus*, formerly *Clupea sprattus*, a fish of the family *clupeidæ*, very abundant on many parts of the British coast, and elsewhere in the northern parts of the Atlantic. It is smaller than the herring, being only about six inches in length when full grown, but much resembles it. It is, however, easily distinguished by the serrated belly, and by the position of the fins, the ventral fins beginning immediately beneath the first ray of the dorsal fin, and not beneath the middle of it, as in the herring and pilchard. Another easily observed distinction is the want of axillary scales to the ventral fins, which both the herring and pilchard have. The dentition is also different, and on this account Valenciennes has constituted, for the sprat and a number of other species, the new genus *harengula*, characterized by having teeth on the jaws, tongue, palatines, and pterygoids, but no teeth on the vomer. The herring has teeth on the vomer. Valenciennes states also that the sprat has only 48 vertebræ, whilst the herring has 56. Notwithstanding all this, an old opinion has recently been revived, and urged with some pertinacity on public attention, that the sprat is the young of the herring, which, therefore, it is injurious to a more important fishery to capture. Except that it is not common to find sprats full of roe, nothing has been stated in support of this notion more to the purpose than that the serratures of the belly may possibly be a provision for the growth of the fish; a provision to which it may be remarked that nothing analogous appears in any province of nature. Nor is it wonderful that many sprats may be examined without roe being found, as the greater part of those taken on our coasts have not attained their full size. Sprats abound especially on the coasts of Norfolk, Suffolk, Essex, and Kent in November and several following months. The net used for their capture has smaller meshes than the herring-net. Drift-net fishing is practiced as for herring, and a method called *stow-boat* fishing in which a large bag-net is suspended between two horizontal beams beneath the boat, and about a fathom from the bottom of the water; ropes from the ends of the upper beam enabling the fishermen in the boat to keep the mouth of the bag always open and against the tide. Vast quantities of sprats are taken in this way, so that they are used as manure by farmers, although London is also very largely supplied with them, and being sold at a very cheap rate, they are a favorite article of food of the poorer classes. The firth of Forth also produces sprats—in Scotland, called *garvies*—so abundantly that they are sold both in Edinburgh and Glasgow by measure, and cheaper than any other kind

of fish. But there are many parts of the British coast where the sprat is rare, some of these being parts where the herring is plentiful. Notwithstanding its cheapness, the sprat is a very fine fish, of flavor quite equal to the herring, although decidedly different. Dried sprats are a very common article of provision, and sprats are also sometimes salted. The *kilkie*s brought from Riga and other ports on the Baltic, are sprats cured with spices; and many of the boxes of *sardines* which are sent to market from the west coast of France, are really filled with sprats. The value of the sprat does not seem to be as yet fully appreciated in Britain. Very closely allied to the sprat is another fish (*Harengula latulus*), the *blanquette* of the French, which is caught in great abundance on some parts of the west coast of France. Other species of *Harengula* are found in other seas. One of them (*H. humeralis*), which abounds in the West Indies, and southward as far as Rio Janeiro, is much esteemed, but becomes dangerous at certain seasons, from some unknown cause.

SPRAT, THOMAS, D.D., 1636-1713; b. England; graduated at Oxford; fellow of the Royal society, chaplain to the duke of Buckingham and to Charles II.; canon of Windsor, 1680; dean of Westminster, 1683; bishop of Rochester, 1684; dean of the chapel-royal, 1685; one of the commissioners for ecclesiastical affairs in the reign of James II. In 1692 an attempt was made to implicate him in treason, but he was acquitted. He published *History of the Royal Society*; *Life of Cowley*; *Answer to Sobiere*; *History of the Rye-House Plot*.

SPRENGER, ALOYS, b. Nassereit, Tyrol, 1813; studied medicine and oriental languages at Vienna; entered the service of the East India company; pres. of the college of Delhi in 1845; editor of a Hindustani weekly, *Kiran Alsadain*, and the *Bibliotheca Indica*; was in 1850 government interpreter, secretary of the Asiatic society, and examiner at the College of Fort William in Calcutta. In the *Bibliotheca Indica* he published translations from the Arabic and Persian; also *Life of Mohammed*. In 1858 he was appointed professor of oriental languages at Bonn, and published *Das Leben und die Lehre des Mohamed*, 3 vols. His extensive oriental library was bought by the Royal library in Berlin. He d. 1893.

SPREAD EAGLE. See **EAGLE**.

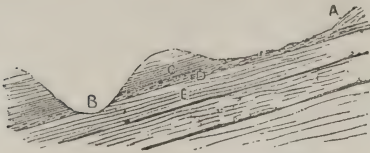
SPREE, a river of Prussia, rises near Ebersbach in the e. of Saxony, on the borders of Bohemia, and after an irregularly winding, but generally n. and n. western course of 200 m., falls into the Havel (q. v.) at Spandau. It has all the peculiarities of a stream flowing through a low and marshy region—abounding in fish, and frequently expanding into lakes, the largest of which are the *Schwiebelsee* and *Müggelsee*. Its banks are flat, sometimes sandy and wooded, and sometimes rich in meadow pastures. It becomes navigable for small craft at Kosenblatt. The principal towns past or through which it flows are Bautzen, Spremberg, Kottbus, Lübben, Beeskow, and Berlin. Its trade is very considerable. By the Friedrich Wilhelm's or Müllrose canal, it is connected with the Oder.

SPRING, a stream of water issuing from the earth. The source of springs is the rain and snow that falls from the clouds. Very little of the water precipitated in any district finds its way immediately by rivers to the sea; the great proportion is either evaporated from the surface of the earth, and, reabsorbed by the atmosphere, is employed by plants and animals, or sinks into the earth. All loose soils and gravels greedily absorb water, which descends until it meets with a stratum through which it cannot penetrate. A pit dug into the water-charged soil would speedily fill itself by draining the water from the soil. All rocks contain water; some retain it by capillary attraction, like a sponge, others hold it merely mechanically, and easily part with it. Chalk will absorb and retain one-third of its bulk of water; and sand, on the other hand, while it will absorb as much, will part with nearly the whole amount to a well dug in it. Argillaceous deposits and compact rocks are barriers to the passage of water, and cause the superincumbent pervious strata to become water-logged, where there is no outlet. Sometimes the edges of the strata are exposed on the sides of a valley, and permit the free escape of the contained water, which pours from them over the neighboring land. But rents and fissures, as well as inequalities on the surface of the impervious beds, give the water a circumscribed course, and cause it to issue in springs.

The water, as it percolates through the earth, always becomes more or less charged with foreign matter, owing to its solvent property. Carbonate, sulphate, and muriate of lime, muriate of soda, and iron, are the most common impurities in spring-waters; magnesia and silica also frequently occur. These substances, from the evaporation of part of the water, or the escape of the carbonic acid gas, by which so large a quantity is often held in solution, are frequently deposited on the margins of the springs, or in the courses of the streams flowing from them. Such deposits are found in all so-called petrifying springs; and the hot wells of Iceland and the Azores are surrounded with basins formed of siliceous sinter which has been derived from the water. When the foreign ingredients have medicinal qualities, the springs are known as mineral waters (q. v.).

Springs are either associated with the superficial strata, or rise from a considerable

depth. *Surface-springs* occur where the absorbent surface-deposits rest on an impervious bed, which prevents the further downward progress of the water, or where the beds through which the water flows are near the surface, as shown in the fig. where C and E are impervious clay-beds, and D is a bed of sand or gravel, which in the upper portion is exposed on the surface, or is only overlaid by loose soil, and after being covered for some distance by the clay bed C, makes its appearance again at B, where the valley cuts it through; here the



water collected over the area, A, is discharged. Surface-springs, depending as they do so directly on the rain for supplies, are very variable in the amount of water they deliver. They frequently fail entirely in the summer, and always after great droughts. Their temperature varies with that of the district where they exist, being warm in summer, and cold in winter, as they do not penetrate below that plane in the earth's crust which is affected by the seasonal changes in temperature.

When the bed which forms the reservoir for the spring is at such a distance from the surface as to be beyond the zone of season changes, and yet within that which is influenced by the climate, the water has a temperature equal to the mean temperature of the locality where it springs. Such springs have generally a large area for the collection of the superficial water, and are consequently regular in the quantity of water they give out. They are brought to the surface by means of faults. The celebrated well of St. Winifred at Holywell, in Flintshire, rises through a fault in the coal measures. It discharges at the rate of about 4,400 gallons per minute, being the most copious spring in England, and the water, in its short course of little more than a mile to the sea, is used to propel 11 mills.

Most deep wells have a lower origin than the zone of climate temperature, which in Britain is between 200 and 300 feet. It is well known that a regular increase in the temperature is observed after this zone is passed, equal to 1° of Fahr. for every 55 feet. As wells have a temperature corresponding to that of the strata from which they spring, it follows that the deeper the spring the higher will be its temperature. Local conditions may affect the thermal state of springs, as in the case of the Geysers in the active volcanic district in Iceland, and the warm springs near Naples; but where no such local influences exist, the depth of the bed from which the water comes may be to some extent estimated by its temperature. Thermal springs occur in Britain at Matlock (66° Fahr.) and Buxton (82°) in Derbyshire, at Bath (117°) in Somerset, and at Clifton (76°) in Gloucestershire. Artificial communications have been opened with deep-lying strata, by which the water they contain has been brought to the surface, and in these the temperature is found to increase in proportion to the depth of the bore. See ARTESIAN WELLS. The most remarkable thermal springs are the Geysers of Iceland, which are fully described under GEYSER.

Intermittent springs are sometimes produced by the ebb and flow of the tide, as at Richmond, where the rise at high water is seen in the wells which flow from the arenaceous strata on the banks of the Thames; and sometimes they depend on the supply of rain-water. But there is a kind of spring the intermittences of which are believed to be owing to the structure of the internal cavities from which the supply is obtained. A large reservoir is fed by the rain percolating through the rock. It communicates with the surface by a siphon-shaped tube. As long as the water in the reservoir is at a lower level than the arch of the siphon, no water can escape; but as soon as it reaches its level, the whole of the water in the cavity will be drawn off, the spring will then cease, and will only make its appearance when sufficient water has accumulated to permit the siphon again to act.

SPRING, GARDINER, D.D., 1785-1873; b. Mass.; graduated Yale college, 1805; studied law with Judge Dagget, New Haven; taught school two years in Bermuda; admitted to the bar, New Haven, 1808; practiced a year; studied theology at Andover theological seminary, receiving calls while there from the South Parish and Park street church, Boston; was licensed to preach, 1809; ordained pastor of the Brick Presbyterian church, New York, 1810. He declined the presidency of Hamilton and Dartmouth colleges. Of his numerous publications, the following are the most prominent: *Essays on the Distinguishing Traits of Christian Character*; *Fragments from the Study of a Pastor*; *Obligations of the World to the Bible*; *The Attraction of the Cross*; *The Bible not of Man*; *The Power of the Pulpit*; *The Mercy Seat*; *First Things*; *The Glory of Christ*.

SPRING, SAMUEL, D.D., 1746-1819; b. Mass.; graduated at Princeton college, 1771; licensed to preach, 1774; chaplain in continental army, 1775, and accompanied Arnold's expedition to Canada; ordained pastor of a church at Newburyport, 1777, where he remained till his death. He aided in forming the Massachusetts missionary society, 1799, of which he was president; was the primary agent in the establishment of Andover theological seminary, and was prominent in the organization of the American board in 1810. Besides several controversial works, he published 25 miscellaneous discourses.

SPRING-BALANCE, THE, for determining the weight of bodies, consists of a spring in the form of a cylindrical coil, through which passes freely a graduated bar, having a hook attached to its under end, and a plate to its upper. The spring is inclosed in an oblong or cylindrical box, quite closed except at the bottom, where there is a hole just large enough to allow the free passage up and down of the graduated bar. When the instrument is to be used, it is suspended by a ring fastened to the upper part of the box; the weight to be estimated is then hung on the hook, and pulls down the rod, the button or plate at the top of which compresses the helical spring within against the bottom of the box; and the graduation corresponding to this amount of compression of the spring is read off at that part of the rod which just shows itself outside. In another form of the spring-balance, known as Salter's balance, a brass index-plate is attached to the side of the box, and a vertical slit through both plate and box is made from top to bottom; the weight is in this case read off on the plate by a pointer fastened to the spring, and protruding through the slit. In a third form, known as Martin's "index weighing-machine," the interior rod, instead of being graduated, is furnished with a rack on one side; this rack moves a toothed wheel fastened on the side of the instrument; and this wheel, again, has at one extremity of its axis a long index, which, on the wheel being put in motion, traverses a circular dial-plate, on which the graduations of weight are marked. The advantage of this last construction consists in the arrangement of the size of the toothed wheel to that of the dial-plate, so that, since the toothed wheel and index make a complete revolution simultaneously, a small motion of the former may produce a large motion of the latter, and the weight of the body be much more accurately read off than can be done directly on the graduated rod. The spring-balance has one advantage over the ordinary balance, that it does not estimate unknown weight by that which is known, and is therefore applicable to the determination of "absolute" weight in all latitudes, at the equator as well as at the poles; but it has the great disadvantage of being considerably affected by change of temperature, the force of the spring to resist compression being diminished as the temperature increases at the rate of $\frac{1}{5000}$ for each degree of Fahrenheit, and consequently the apparent weights of bodies must be corrected in this proportion. Various other forms of springs, semi-circular, elliptical, etc., are employed, instead of the helical spiral, in several French balances, but in other respects the instruments correspond. The spring-balance is also called a "dynamometer," from its being employed to indicate the intensity of the forces exerted by animals or machines; for this purpose, it is attached between the force and its object, the force being applied to its object solely through the medium of the dynamometer.

SPRINGBOK, *Antelope euchore*, or *Antidorcas euchore*, a species of antelope, nearly allied to the gazelles, very abundant in south Africa. It is an extremely beautiful creature, of graceful form and fine colors. It is larger than the roebuck, and its neck and limbs much longer and more delicate. The general color is fulvous brown on the upper parts, pure white beneath, the colors separated on the flanks by a broad band of deep vinous red. The whole head is white, except a broad brown band on each side from the eye to the mouth, and a brown spot in the center of the face. Two curious folds of skin ascend from the root of the tail, and terminate near the middle of the back; they are usually closed, but open out when the animal is bounding, and disclose a large triangular white space which is otherwise concealed. The springbok derives its name from the prodigious leaps which it takes either when alarmed or in play, often to the height of 7 ft., and sometimes of 12 or 13 ft. Its ordinary residence is in the *karroos* or arid sandy plains; but when all pasture there is burned up, immense herds congregate together, and migrate to more fertile regions, often devastating the fields of the colonist. Mr. Pringle speaks of seeing the country near the Little Fish river specked with them as far as the eye could reach, and estimates the number in sight at once as not less than 25,000 or 30,000. Capt. Cumming describes a still more extraordinary scene, a vast herd pouring through an opening among hills, in one living mass, half a mile in breadth, and so continuing for hours together. So dense are these herds sometimes in their migrations that the lion or the leopard, which ordinarily hangs on their skirts with a view to prey, is taken prisoner, and compelled to march along in the midst.

SPRINGER, WILLIAM M., b. Sullivan co., Ind., 1836. He removed with his parents to Ill., 1848; graduated at the Ind. state univ. 1858, and at law 1859; was sec. of the Ill. constitutional convention 1862, and a member of the state legislature 1871-72. He was a member of congress from Illinois, 1875-95; chairman of the ways and means committee, 1891-93.

SPRINGER. See ARCH.

SPRINGER, a kind of dog, regarded as a variety of the Spaniel (q.v.). It is small, elegant, usually white, with red spots, black nose and palate, long pendent ears, and small head. Its aspect is very lively, and its manners equally so. It is used by sportsmen for raising game in thick and thorny coverts. There are several breeds or sub-varieties.

SPRINGFIELD, city, capital of Illinois, and co. seat of Sangamon co.; on the Baltimore and Ohio Southwestern, the Chicago and Alton, the Chicago, Peoria, and St.

Louis, the Illinois Central, the St. Louis, Chicago, and St. Paul, the St. Louis, Peoria, and Northern, and the Wabash railroads; 190 miles s. of Chicago. The city has a beautiful location on a prairie, is about 5 miles s. of the Sangamon river, and is laid out regularly, with streets crossing at right angles. There are electric lights and street railroads, waterworks supplied from wells by direct pressure, several national and state banks, about 35 churches, and daily, weekly, and monthly periodicals. The noteworthy buildings include the state capitol, U. S. government building, governor's mansion, state arsenal, co. court-house, city hall, the former residence of President Lincoln, the superb national monument to his memory in Oak Ridge cemetery, the St. John's and Wabash Railroad hospitals, and the Prince sanitarium. The city has public school property valued at \$300,000, and, among educational institutions, Concordia college (Lutheran), St. Agatha's school (P. E.), Bettie Stuart institute (non-sect.), and several Roman Catholic convent and parochial schools. Besides the school library there are the public, the state historical, the state, and the state museum of natural history libraries. The city is the seat of a Protestant Episcopal bishopric. The U. S. census of 1890 reported for Springfield, 374 manufacturing establishments, employing \$3,641,415 capital and 3,269 persons, paying \$1,745,158 for wages and \$3,790,754 for materials, and having a combined output valued at \$6,562,470. The principal industrial plants are rolling mills, machine shops, plow works, watch factory, furniture factory, and more than a dozen coal shafts. Pop. '90, 24,963.

SPRINGFIELD, city and co. seat of Hampden co., Mass.; on the Connecticut river, the Boston and Albany, the Boston and Maine, the New England, and the New York, New Haven, and Hartford railroads; 99 miles w. of Boston. It contains the villages of Brightwood, Indian Orchard, and Sixteen Acres; was known as Agawam by the Indians; was settled in 1635 by parties from Roxbury, and organized as a town in 1636; was burned by the Indians in 1675; and was made a city in 1852. The city is beautifully situated, partly on level ground, and from its highest part, Arsenal hill, a fine view of the Connecticut valley is obtained. Its streets are shaded with large and old trees. The river is crossed at this point by bridges connecting with West Springfield and Agawam. There are several cemeteries; Forest park, Hampden park, containing race tracks; and on Armory Hill a park of 72 acres, in which is situated the U. S. armory. The city is lighted by electricity; and has electric street railroads connecting with Chicopee, Chicopee Falls, and Holyoke; and is supplied with water from the Ludlow reservoir. It is the seat of a Roman Catholic bishopric, and contains over 40 churches, the Congregational predominating. Over \$1,000,000 is invested in public school property. The educational institutions include the French-American college, International, Y. M. C. A. training school, school for Christian workers, industrial institute, and high, grammar, and other public day and evening schools. Among the noteworthy buildings are the U. S. armory, U. S. government building, high school, art museum, Y. M. C. A. building, Court Square theater, Union depot, co. court house, public library, soldiers' monument, and the statue of *The Puritan*, in Stearns park, a memorial to Samuel Chapin, one of the early settlers of the city. The U. S. census of 1890 reported for Springfield, 692 manufacturing establishments, employing \$13,199,283 capital and 10,250 persons, paying \$5,868,894 for wages and \$7,817,534 for materials, and having a combined output valued at \$17,040,692. Besides the U. S. armory, the principal industrial plants are the Smith and Wesson revolver works, the Wason railroad car shops, and extensive manufactories of envelopes, bicycles, cotton and woolen goods, locomotives, boilers, iron bridges, machinery, skates, etc. There are over 15 national, savings, and co-operative banks, and trust companies, and a large number of daily, weekly, and monthly periodicals. Pop. '90, 44,179.

SPRINGFIELD, city and co. seat of Greene co., Mo.; on the St. Louis and San Francisco and the Kansas City, Fort Scott, and Memphis railroads; 130 miles s. of Jefferson City. The city is built on the summit of the Ozark mountains, in a rich zinc and lead region, has a mild and healthful climate, and is near the battle-field of Wilson creek, where Gen. Lyon, of the union army was killed during the civil war. It is regularly laid out, and has a supply of excellent water from mountain springs, electric lights, electric street railroads, national and state banks, about 20 churches, and daily, weekly, and monthly periodicals. There are a U. S. government building, national and confederate cemeteries, St. John's hospital, Drury college (Cong.), high school, Y. M. C. A. (the three last with libraries), and a normal school. Over \$1,500,000 is invested in manufactories, which have an annual output of over \$3,000,000. The two railroads passing through the city have each extensive construction and repair shops, and there are also iron works, foundry, and wagon and furniture factories. Pop. '90, 21,850.

SPRINGFIELD, city and co. seat of Clarke co., O.; on Mad river and the Cleveland, Cincinnati, Chicago, and St. Louis, the Erie, the Ohio Southern, and the Pittsburg, Cincinnati, Chicago, and St. Louis railroads; 45 miles w. of Columbus, the state capital. It derives good power both from the Mad river and the Lagonda creek, which passes through the city and park, and manufacturing is largely promoted thereby. The U. S. census of 1890 reported for Springfield 372 manufacturing establishments, employing \$14,567,931 capital and 6,693 persons, paying \$3,195,441 for wages and \$4,752,062 for materials, and having a combined output valued at \$10,760,965. The distinctive industry of the city is the manufacture of agricultural implements, particularly reapers,

mowers, cultivators, and grain drills. Other important manufactures are steam road rollers, piano plates, bicycles, rubber tire wheels, metal wheels, gray iron and malleable castings, iron bridges, electric power plants, water wheels, steam and lawn mowers, gas engines, emery wheels, etc. The city is the seat of Wittenberg college (Lutheran), and has a seminary, business college, Mitchell-Thomas hospital, Warder public library, U. S. government building, municipal building, co. court-house, Children's home, State Masonic home, State Pythian home, State Odd Fellows' home, Lagonda club house, Snyder park, and Fern Cliff cemetery. There are gas and electric light plants, electric street railroads, waterworks belonging to the city with a capacity of 12,000,000 gallons per day, about 45 churches, several national banks, savings banks, and many daily, weekly, and monthly periodicals. Pop. '90, 31,895.

SPRINGFIELD, a township in Hamilton co., O.; containing Glendale, Hartwell, and Wyoming villages and parts of Arlington Heights, Carthage, and Lockland villages; pop. '90, 10,793.

SPRING GARDEN, a township in York co., Penn. Pop. '90, 5209.

SPRINGS, MECHANICAL, are very variously constructed for different purposes. The simplest form of spring is a piece of elastic metal wire, rolled on a mandrel, so as to form a continuous single cylindrical coil of any length needed. Clock and watch springs are made in flat coils, thin bands of steel being used. The *balance-spring* of watches is, however, made of fine wire often thinner than hair. Coach-springs are formed of a series of curved narrow plates of steel of different sizes, placed one over the other, the largest being at the bottom, and the others in regular succession according to size, the whole being held together with nuts and screws. These are some of the commonest forms.

SPRIT (*spr̄iet*, Dutch; old English verb, *spr̄it*, to sprout or spring out) means a pole or spar. The word occurs most frequently in the compound, bowsprit, which explains itself. When used alone, a sprit is a diagonal yard for sustaining a quadrilateral (usually square) fore-and-aft sail.

SPROAT, EBENEZER, 1752-1805; b. Middleboro, Mass.; called by the Indians *Big Buckeye*; entered the army with the rank of capt., 1775; rose through successive grades to be lieut.col. commanding 2d Mass. regiment. He led his command through the battles of Trenton, Princeton, and Monmouth under Brig.Gen. Glover; was appointed by Gen. Steuben brigade inspector. At the close of the war he took up his residence as a surveyor in Providence, R. I., where he married a daughter of Commodore Whipple. He was land-surveyor of Ohio in 1786; one of the founders of Marietta in 1788; col. of militia and sheriff for 14 years.

SPRUCE. See FIR.

SPRUCE, ESSENCE OF, AND SPRUCE-BEER. The essence of spruce is obtained by boiling the green tops of the black spruce (*abies nigra*) in water, and then concentrating the decoction by another boiling without the spruce tops. The young shoots of this fir, like most others of its family, are coated with a resinous exudation, which is dissolved in the water. The beer is made by adding the essence of spruce to water in which sugar or treacle has been dissolved, in the proportion of about 4 oz. of essence of spruce to 10 lbs. of sugar, or 3 qts. of treacle, and 10 or 11 gals. of water, with about half a pint of yeast.

SPULLER, EUGÈNE, French politician, was born at Seurre in 1835, studied at the Lyceum and at Dijon, and became a member of the Paris bar in 1862. Shortly after he was editor of the *Europe* of Frankfort, and contributed to the *Journal de Paris* and the *Journal de Genève*. In 1868 he was one of the founders of the *Révue Politique*. He strongly opposed the plébiscite of May, 1870, and after the revolution of Sept. 4, 1870, was the confidential friend and secretary of Gambetta. He was principal editor of *La République Française* from 1871 to 1876, when he was elected a Deputy for the 3rd arrondissement of Paris, and re-elected in 1881. In 1887 he became Minister of Public Instruction; in 1889 replaced M. Goblet in the Department of Foreign Affairs, and the same year was elected Deputy from Beaune. He has written *Michelet, sa vie et ses œuvres* (1876); *Ignace de Loyala et la Compagnie de Jésus* (1876); *La Compagnie de Jésus devant l'histoire* (1877); and a collection of his *Conférences* (1879-81); *Figures Disparues* (1886); *Conférence sur la Vie et les Œuvres de François Rude* (1888). D. 1896.

SPUNGING-HOUSES are, in the law of England, the private houses of the bailiffs, who may detain there a debtor who has been arrested for debt for 24 hours, to admit of his or his friends' arranging to settle the debt; and the name is derived from the extortion often practiced in this state on the debtor.

SPUR, an apparatus fastened to the heel of a horseman, for goading the horse. It is much less used than formerly. All cavalry soldiers wear spurs; but their use, except in the heat of an actual charge, is discouraged as much as possible. In the days of chivalry, the use of the spur was limited to knights, and it was among the emblems of knighthood. To win his spurs, was for a young man to earn knighthood by gallant conduct. The degradation of a knight involved the hacking off of his spurs; and the serving before a knight of a pair of spurs on a dish, was a strong hint by his host that he had outstayed his welcome. See illus., ANCIENT ARMOR, vol. I.

SPURGE, *Euphorbia*, a genus of plants of the natural order *euphorbiaceæ*, having monœcious naked flowers, the male flowers membranous, and surrounding a tricocous stalked female flower, the whole placed within a cup-shaped involucre. The fruit has three valves and three cells, the cells one-seeded, and bursting elastically. The species are very numerous, natives of warm and temperate climates, mostly herbaceous, but some of them woody. About 12 species are natives of Britain. All contain a resinous milky juice, which in most is very acrid.

SPURGE-LAUREL. See **DAPHNE**.

SPURGEON, CHARLES HADDON, a celebrated preacher, was b. at Kelvedon, Essex, in 1834. Intended by his family for the office of an Independent minister, his own sympathies drew him toward the Baptists, whose connection he joined in 1850. He became at once an active tract-distributor and school-teacher; and, removing to Cambridge in 1851, began to deliver cottage sermons in the neighborhood. The popularity of the "boy-preacher" was almost immediately established; and at the age of 18 he had charge of a small Baptist congregation in the village of Waterbeach. In 1853 he entered upon the pastorate of the New Park street chapel, London, where his preaching proved so attractive, that, in two years' time, the building had to be greatly enlarged. His hearers continuing to increase, the Surrey music hall was for some time engaged for his use; and finally his followers built for him his well-known "Tabernacle," in Newington Butts, opened in 1861. The evangelistic and philanthropic agencies in connection with this immense chapel comprise the Stockwell Orphanage, of which Spurgeon is president; a pastor's college, where hundreds of young men are trained for the ministry under Spurgeon's care; the Golden lane mission, etc. Spurgeon continued to preach in the tabernacle every Sunday to thousands of hearers. His sermons have been published weekly since 1854, and yearly volumes have been issued since 1856. They have had an enormous circulation, and many of them have been translated into various languages. He also published *John Ploughman's Talk*; *Morning by Morning*, *Evening by Evening*; *The Treasury of David*; *Lectures to my Students*; *The Saint and his Saviour*, etc.; and since 1865 he had edited a monthly magazine, *The Sword and the Trowel*. He died in 1892.

SPURN HEAD, the name given to the extreme point of a long, low, narrow, and shingly peninsula in the s.e. of Yorkshire, at the mouth of the Humber, 24 m. s.e. of Hull. Two light-houses have been built here, one of which is in lat. 53° 34' 7" n., and long. 0° 7' 2" east.

SPURREY, *Spergula*, a genus of plants which has been variously ranked by botanists in the natural orders *caryophyllææ*, *illecebrææ*, and *crassulæææ*. The species are annuals, dichotomously branched, or with whorled branches; their leaves linear-filiform, in clustered whorls, with membranaceous stipules; the flowers in terminal divaricating corymbs. The flowers have a calyx of five sepals, five white petals, five or ten stamens, and five styles; the capsule is five-valved, with numerous round seeds, surrounded with a membranous border. **COMMON SPURREY**, or **YARR** (*S. arvensis*), is plentiful in corn-fields, especially on light stony or sandy soils in Britain and most parts of Europe. In some parts of Europe a larger variety is frequently sown for fodder, and is much relished by cattle.

SPURZHEIM, KASPAR, a German physician and phrenologist, was b. near Treves, Dec. 31, 1776. While studying medicine at Vienna he was introduced to Dr. F. J. Gall (q. v.), whose pupil, and afterward colleague, he became, in investigating the structure and functions of the brain (see **PHRENOLOGY**), in lecturing on the subject, and in writing for the press. In 1807 they settled in Paris, but parted in 1813; and next year Spurzheim came to England, where he published *The Physiognomical System of Drs. Gall and Spurzheim* (Lond. 1815), *Outlines of the same* (1815), and a treatise on *Insanity* (1817). The first of these works having been severely handled by Dr. John Gordon in no. 49 of the *Edinburgh Review*, Spurzheim proceeded to Edinburgh, and, in the lecture-room of his critic, demonstrated the reality of the anatomical discoveries which had been denied and ridiculed. To the same and other opponents, he replied in *An Examination of the Objections made in Britain against the Doctrines of Gall and Spurzheim* (Edinburgh, 1817). It was about this time, and under his tuition, that George Combe (q. v.) became a student of phrenology. After lecturing in many British and Irish cities, Spurzheim returned, in 1817, to Paris; but from 1825 till his death he resided much in England, teaching and defending his opinions in lectures and books. In 1832 he went to America for the same purpose, and began his labors at Boston, but was cut off by fever on Nov. 10 in that year. Besides the English works already mentioned, he wrote: *Elementary Principles of Education* (Edinburgh, 1821; 2d ed., Lond. 1828; French translation, Paris, 1822); *Phrenology* (Lond. 1825); *Philosophical Principles of Phrenology* (1825); *Phrenology in Connection with the Study of Physiognomy* (1826); *Anatomy of the Brain* (1826), supplemented in 1829 by an appendix, with *Remarks on Charles Bell's Animadversions on Phrenology*; *Outlines of Phrenology* (1827); and *Sketch of the Natural Laws of Man* (1828). Some of these were reprinted at Boston. His French works (besides those written jointly with Gall) are: *Obs. sur la Folie* (Paris, 1818); *Obs. sur la Phrénologie* (1818); *Essai Philosophique sur la Nature Morale et Intellectuelle de l'Homme* (1820); and *Manuel de Phrénologie* (1832). See *Phren. Jour.*, vol. viii. p. 126; *For. Quart. Rev.*, vol. ii. p. 15; *Memoir of Spurzheim*, by A. Carmichael (Dublin, 1833); and Combe's *System of Phrenology*.

SPUYTEN DUYVIL CREEK, a channel connecting the Hudson and Harlem rivers and separating Manhattan island, on which the greater part of New York city is built, from the mainland on the n. The construction of the Harlem ship-canal (opened in 1895) comprised the widening and deepening of the channel of the Harlem river and Spuyten Duyvil creek and the cutting of a canal through an intervening neck of land. The canal is 7 miles long, and saves over 25 miles of distance in the traffic between the Hudson river and Long island sound.

SPY, in war, is a useful but not highly honored auxiliary, employed to ascertain the state of an enemy's affairs, and of his intended operations. Spies have been used in all wars from the time when Moses sent Joshua on such a purpose to the present time. Their employment is quite recognized by the law of nations as interpreted by Grotius, Vattel, and Martens; nor is it held to be any dishonor to a general to avail himself of their services. On the other hand, the spy himself is looked upon as an outlaw, and one devoid of honor. If taken by the enemy, he is put to death ignominiously and without mercy. As, however, the calling is so dangerous, and so little redounds to honor, it is never permissible for a general to compel by threats any person, whether of his own or the hostile party, to act as spy; but he is at liberty to accept all such services when proffered. A spy is well paid, lest he betray his employer. In the British army spies are usually controlled by the quartermaster-general. Martial law, though distinct enough in ordering the death of a spy, is not clear in defining what constitutes a spy. A man—not of the enemy—within the enemy's lines, and in the enemy's uniform, would presumably be a spy. If in civil dress, and unable to give a good account of himself, his chance of hanging would be considerable; but if found in one camp in the uniform of the opposite side, he may not be treated otherwise than as a prisoner of war, or at least as a deserter from the enemy.

Both as regards honor and penalties, it would seem that spies ought in fairness to be divided into two classes—first, those who betray their own country to an enemy; secondly, those who, being enemies, contrive surreptitiously to obtain information by penetrating into the opposing army. The first class are traitors of a deep dye, for whom no ignominious death is too bad; but the second class are often brave men, who dare much in the service of their country. It is unfair to accord them the same treatment as the traitors.

SQUAD (diminutive of squadron) is any small number of men assembled for the purposes of drill or inspection. A troop or company of soldiers should be divided into as many squads as there are officers or sergeants at hand to drill them.—The *awkward squad* comprises recruits not yet fitted to take their places in the regimental line.

SQUADRON (Ital. *squadra*, from Lat. *quadra*, a square), in military language, denotes two troops of cavalry. It is the unit by which the force of cavalry with an army is always computed. Three or four squadrons constitute a regiment. The actual strength of a squadron varies of course with that of the component troops; but it ranges from 120 to 200 sabers.

In naval affairs a squadron is a section of a fleet, and constitutes the command of a junior flag-officer or commodore.

SQUALUS AND SQUALIDÆ. See SHARK.

SQUAMIPENNES. See CHÆTODONTIDÆ.

SQUARE, in military evolutions, is the forming of a body of men into a rectangular figure, with several ranks or rows of men facing on each side. With men of ordinary firmness a square should resist the charges of the heaviest horse. The formation is not new, for a Grecian syntagma was a solid square of 16 men in every direction; but in modern warfare the solid square, having been found cumbersome, has been abandoned for the hollow square, with officers, horses, colors, etc., in the center. The front rank kneels, and the two next stoop, which enables five ranks of men to maintain a rolling fire upon an advancing enemy, or to pour in a murderous volley at close quarters.

SQUARE, in geometry. See PARALLELOGRAM.

SQUARE AND SQUARE ROOT are particular cases of *involution and evolution* (q.v.), in which the second power and root are alone involved. The process by which the square root of a number is obtained resembles division, differing only by the circumstance that the divisor is changed at each successive step. The rule adopted in arithmetic is deduced from algebra in the following manner: The square of $a + b$ is $a^2 + 2ab + b^2$, which may be written $a^2 + b(2a + b)$; and to find the square root of the latter we have merely to subtract a portion (a^2), taking care that it be a square number, and forming a divisor with twice the square root of this portion ($2a$) increased by (b) the remainder of the root (which, in arithmetic, must be found by trial, as in division), and putting (b) the remainder of the root now found, in the quotient, proceed as in division. This mode of obtaining a divisor from the part of the root already obtained (a), and the part next to be obtained (b), and employing it, must be repeated till the whole square root is found. In the extraction of the square root in arithmetic it is assumed that the squares of the nine digits are known, and also that the square of a number contains either twice, or one less than twice, as many digits as the number itself contains, the former being the case when the square number has an *even* number of digits, the latter when the number of

digits is *odd*. By dividing, then, a number into periods of two figures each, we can at once see how many digits its root contains. To illustrate the method of operation adopted in arithmetic and algebra, let the square root of 128,881 be required; remembering that the square of $a + b + c$ is $a^2 + 2ab + b^2 + 2(a + b)c + c^2$:

$$\begin{array}{rcl}
 (a^2 =) 300^2 & = & 90000 \\
 12,88,81(300 + 50 \text{ (or } 350) + 9 = 359 & & a = 300 \quad 12,88,81(300 = a \\
 a + b \text{ (or } a + b) + c & & 300 \quad 90000 \quad 50 = b \\
 38881 & & 2a + b = 650 \quad 38881 \quad 9 \\
 2 \times 300 \times 50 + 50^2 = & 32500 & 32500 \quad 359 \\
 2(a + b)c + c^2 & & 2(a + b) + c = 709 \quad 6381 \\
 2 \times 350 \times 9 + 9^2 & = & 6381
 \end{array}$$

In the common arithmetical mode the zeros are omitted, and we subtract from 12 the square nearest to it, not recognizing the portion of the root, 3, as more than a digit of units till the next period, 88, has been brought down for the second step, when it is evident that the 3 is *at least* 3 tens, and consequently the 6 in the divisor represents 60; similarly, it is only at the commencement of the third step that we find the 5 to represent 50, and the 3, 300. A comparison of the above examples will show the agreement and difference between the two modes.

SQUARE-PIERCED, in heraldry, a term used to designate a charge perforated with a square opening, so as to show the field. A cross square-pierced is often improperly confounded with a cross quarter-pierced, where the intersecting part of the cross is not merely perforated, but entirely removed.

SQUARES, METHOD OF LEAST, in astronomy, the best mode hitherto discovered of obtaining the most correct result from a number of observations upon any phenomenon. These observations are assumed to differ slightly from each other, and to be all of equal value, that is, taken under equally favorable conditions, and with equal instruments. The ordinary and long-established mode of approximating to the truth in such cases is by finding the arithmetic mean, and accepting it as the correct result; but in all cases where the result required does not come directly from observation, but requires to be discovered by calculation, this simple and useful method is inapplicable, and that of "least squares," which gives more probable corrections, is adopted. The method is founded on a theorem which was first propounded by Legendre in 1806, more for the sake of insuring uniformity among calculators than from any belief in its intrinsic value; but it was afterward thoroughly discussed and proved, by Gauss and Laplace, that "if the mean of a number of distinct observations be so taken that the sum of the squares of its differences from the actual observations (generally designated *errors*) shall be a minimum, this mean will be, under these circumstances, the correctest obtainable value." For a full view of the whole of this subject, see a paper by Mr. Ellis in the *Cambridge Transactions*, vol. viii.

SQUASH. See **GOURD**.

SQUASH BUG, a hemipterous insect which infests squash, pumpkin, and other like plants. It belongs to the family *coreide*, and is about six-tenths of an inch long and about half as broad; rusty black above, dingy ochre yellow beneath. It emits a strong and offensive odor, which is supposed to be due to the presence of organic formates in the secretions. It passes the winter in crevices and holes, in a torpid state, and when the squash vines put forth a few rough leaves in the spring, it collects beneath them and lays eggs, which it fastens in clusters to the under side. Another kind, the striped squash bug, is a coleopterous insect, *diabrothica vittata*. It is much smaller but more destructive.

SQUATTERS, the name given in the Australian colonies to the sheep-farmers who occupy the unsettled lands as sheep-runs under lease from government. It is applied in the United States to persons who settle on lands to which they have no legal title. See **NEW SOUTH WALES**, **VICTORIA**.

SQUATTER SOVEREIGNTY. See Taylor's Administration in the article **UNITED STATES**.

SQUAW. The native American Indian woman, as found by Columbus and his followers, was in a most degraded state, being in entire subjection to her husband and compelled to perform all the labor of the field and camp, and carry all the burdens. She wore a mantle of feathers, exceedingly warm and handsome, and like her husband, a bead necklace. Her body was tattooed with puceon, which is the blood-root. On hunting expeditions she carried all the implements and built the huts at the end of the long day's march, while the warriors smoked their pipes calmly and looked on, or the youthful braves practised shooting at a target, for by such manly accomplishments they got their wives. Cooking was very simple, the common way being to roast over a fire, without seasoning; baking was done in holes in the ground and water was boiled by placing in it stones intensely heated. Corn was parched and carried with them on hunting expeditions, often being hidden in holes marked for recognition.

SQUAW-MAN is the term applied in the Western territories to a white man who marries an Indian wife. According to the tribal law of the Indians, such a marriage gives the husband all the privileges of a member of the tribe, including an equal share

in the land allotted to it by the government. Such marriages are very common among the frontiersmen, though the squaw-men lose caste with the whites of their acquaintance.

SQUID. See CALAMARY.

SQUIER, EPHRAIM GEORGE, LL.D., American author and archaeologist, was b. at Bethlehem, N. Y., June 17, 1821. In his youth, he was a school-teacher and engineer, and in 1840 was editor of *The Mechanic*, at Albany; in 1843, of the *Hartford Journal*, and in 1844, of the *Scioto Gazette*, in Ohio. His attention being attracted to the antiquities of the Scioto valley, he made an exploration of similar monuments through the Mississippi valley, an account of which was published in 1848, forming the first volume of the *Smithsonian Contributions to Knowledge*. He made similar explorations in New York and Connecticut; and on being appointed *chargé d'affaires* to Guatemala and other states of Central America, he used his official position as a means of making extensive geographical and archaeological explorations in those interesting regions. On visiting Europe in 1851, he was honored with the gold medal of the French geographical society, and made a member of other learned societies. Returning to America (1853), he surveyed a railway route through Honduras, and drew up the treaty between that country and England for the retrocession of the Bay islands. Among his works are—*Nicaragua: its People, Scenery, Ancient Monuments, and Proposed Inter-oceanic Canal* (1862); *The Serpent Symbol, or Worship of the Reciprocal Principles of Nature in America* (1852); *Notes on Central America* (1854); *Waikna, or Adventures on the Mosquito Shore* (1855); *Question Anglo-Américaine* (1856); *The States of Central America* (1857); the report of the Honduras survey (1859); a work on tropical fibers (1861); *Honduras* 1870; *Peru* (1876); articles in the *Encyclopædia Britannica*; etc. He d. 1888.

SQUILL, Scilla, a genus of bulbous-rooted plants of the natural order *Liliaceæ*, nearly allied to hyacinths, onions, etc., and having a spreading perianth, stamens shorter than the perianth, smooth filaments, a 3-parted ovary, and a 3-cornered capsule with three many-seeded cells. Many of the species are plants of humble growth, with scapes like those of hyacinths, and beautiful flowers. Of these, two are natives of Britain: *S. verna*, which is common on the western and northern coasts, and particularly in Orkney and Shetland, and has fragrant flowers of a deep blue color; and *S. autumnalis*, which grows chiefly on the coasts of the s. of England, and has pinkish purple flowers. *S. bifolia* is a very doubtful native of Britain, but adorns hill-pastures and borders of woods in many parts of Europe with its blue flowers in early spring. *S. amana* is another very beautiful species found in many parts of Europe. Few plants are better adapted than these for the adorning of flower-borders, or for house-culture.—Very different in habit from these is the OFFICIAL SQUILL (*S. maritima*, or *Urginea Scilla*), a native of the sandy shores of the Mediterranean, which has a scape from two to four ft. high, with a raceme of many whitish flowers, and large leaves. The bulb is of the size of a man's fist, or sometimes as large as a child's head, and contains a viscid juice so acrid as to blister the fingers if much handled, while the vapor arising from it irritates the nose and eyes. Squill was used in medicine by the ancients, and continues to be so still. The bulb is dug up in autumn, divided into four parts, the center being cut out as being inert, and the remainder being cut into thin slices, which are quickly dried by a gentle heat. It is imported from Malta and other Mediterranean ports; also from St. Petersburg and Copenhagen. The dried slices are white or yellowish white, slightly translucent, scentless, disagreeably bitter, brittle and easily pulverizable if very dry. The chemical composition of Squill is not accurately known, its most active principle being a very acrid, poisonous, resinoid substance, soluble in alcohol, but not in ether. What ever its active ingredients may be, they are taken up by alcohol, vinegar, and the dilute acids. This medicine is prescribed as a diuretic and expectorant, and occasionally as an emetic; but it must be recollected that in moderately large doses it acts as a narcotico-irritant poison, 24 grains having proved fatal. When given as a diuretic, it is usually prescribed in combination with digitalis and calomel, when it seldom fails to produce an increased secretion of urine, while at the same time it promotes the absorption of the effused fluid in the dropsy, which is generally present when diuretics are ordered. Its use is counter-indicated if inflammatory symptoms are present. Its dose as a diuretic is from one to three grains of the powdered bulb, or about twenty minims of the tincture. As an expectorant, it is much employed in the subacute stages and chronic forms of pulmonary affections, and is very serviceable in bronchitis and pneumonia of children. From its property of promoting the secretion of mucus, it gives relief by facilitating the expectoration in cases of asthma, etc., in which the sputa are viscid. In these cases, it is usually associated with some of the more stimulating expectorants, as senega or sesquicarbonate of ammonia. As an expectorant, the dose of the powdered squill should not exceed one grain, repeated several times daily. For children, the syrup, in doses of from 10 to 30 minims, may be given. As its action as an emetic is uncertain, it should not be prescribed with the view of inducing vomiting if other and more certain remedies are at hand.

SQUILLA, a genus of crustaceans, of the order *stomapoda*, the type of a family, *squillidæ*, to which the name *mantis crab*, *mantis shrimp*, and *sea-mantis*, are popularly given,

from the strong general resemblance to the insects of the genus *mantis* (q.v.). The form is elongated; the carapace only covers the anterior part of the thorax, the latter part of which is formed of rings like the abdomen; the eyes are carried on stalks; the claws are very large, and furnished with spines, forming powerful instruments of prehension; the tail is expanded into a broad fin. The species are numerous, and mostly inhabit tropical seas. A species about 7 in. long, *S. mantis*, is found in the Mediterranean. The *squillæ* are extremely active, and very bold and voracious.

SQUINCH, small arches or corbelled courses across the angles of square towers, to bring in the form to carry an octagonal spire, lantern, etc. See PENDENTIVE.

SQUINTING, or STRABISMUS, is a well-known and common deformity, which may be defined as a want of parallelism in the visual axes, when the patient endeavors to direct both eyes to an object at the same time. The squint is said to be *convergent* when the eye or eyes are directed toward the nose, and *divergent* when they are directed toward the temple, and is termed *single* or *double* according as only one eye or both are displaced. The divergent form is comparatively rare, except in consequence of a prolonged loss of sight of one eye. The causes of this affection are various. Intestinal irritation, such as the presence of worms, will often induce it slightly in children. In other cases it may be traced to the temporary cerebral irritation produced by teething; and it is a very common symptom in hydrocephalus and other serious head affections. Among other causes are a want of equal normal visual power in both eyes, in extreme short sight; but from extensive observation with the ophthalmoscope, Mr. Dixon, surgeon to the royal ophthalmic hospital, Moorfields, has come to the conclusion, that "in the great majority of instances of confirmed squint existing in children, the optic nerves themselves are ill-developed, being usually smaller than natural, of a more or less oval form, and of a dusky color."—Holmes's *System of Surgery*, vol. ii. p. 890. If the squint is only temporary, and possibly arises from intestinal irritation, the bowels must be well cleared out, and tonics subsequently given. If it is due to some peculiarity in the visual focus of the eyes, it may be removed by the judicious use of glasses. "In every case," says Mr. Dixon, "a careful ophthalmoscopic examination is the first duty of the surgeon; and he should also take every possible care to ascertain that no organic disease exists in the brain or orbital nerves; and that there is no tumor in the orbit, mechanically burdening the movements of the eye." The surgical operation for the cure of squint consists in the division of the muscle which, by permanently drawing the eye inward or outward, and overpowering its antagonistic muscle, induces the deformity. It is better to dispense with the use of chloroform in this operation if the patient have sufficient nerve to bear the operation without flinching, as in that case the doubt that sometimes arises as to whether the muscle has been sufficiently divided can be at once solved by directing the patient to attempt inversion of the eye; but in the great majority of cases chloroform is found necessary.

SQUINTS, narrow apertures cut in the walls of churches (generally about 2 ft. wide), to enable persons standing in the aisles to see the high altar. These openings are always in the direction of an altar.

SQUIRE, an abbreviated term for esquire (q.v.). The same word is also popularly applied in England to country gentlemen; and in the United States of America to magistrates and lawyers, and sometimes to judges and justices of the peace.

SQUIRREL, *Sciurus*, a Linnæan genus of rodent quadrupeds, now the family *sciuridae*. They belong to the section of rodentia having perfect clavicles, and are further characterized by a long bushy tail; the fore-paws furnished with four toes, which have curved claws, and a tubercular thumb; the hind-legs long, their feet with five toes; two incisors in each jaw; four molar teeth on each side in each jaw, simple, with tuberculous crowns, and a fifth in the front of the upper jaw, which soon falls out. Most of the species commonly carry the tail curved over the body, whence the Greek name *skiouros* (*skia*, a shade, and *oura*, a tail), of which the English *squirrel* is a corruption. The species are numerous, and are found in almost all parts of the world, except Australia; some inhabiting temperate and even cold regions, while some belong to tropical countries. Squirrels are very active and lively creatures, at once shy and pert, very adroit in hiding themselves on the appearance of danger, but resembling monkeys in their inquisitive curiosity. They inhabit woods, and mostly spend their lives in trees, which they climb with wonderful agility, running along the branches, and leaping from tree to tree. Their running is a kind of bounding, and the tail is then stretched out, as it is also in their leaps from branch to branch, which are often to great distances. The flying squirrels are already noticed. Even the true squirrels resemble them in spreading out their limbs and tail to the utmost in leaping, particularly when they descend from a high branch to the ground, and they thus leap from a great height without injury. Some species, however, seldom ascend trees, but burrow in the ground, and are further distinguished by having cheek-pouches, while the tail is shorter than in the tree-squirrels, and its hair not so distinctly arranged in two lateral rows. These *ground squirrels* form the genus *tamias*. All the squirrels feed on fruits and seeds, the young shoots of trees, and other such vegetable substances; although they sometimes vary their diet by plundering birds' nests, and not only sucking eggs, but devouring young birds. They are

also fond of the larvæ of insects. In eating they often sit erect, and hold the food in their fore-paws. The hardest nut presents no difficulty to their sharp strong teeth. Many of the species, and probably all those of temperate and cold climates, lay up stores for winter.—The COMMON SQUIRREL (*S. vulgaris*) of Europe is a beautiful little animal, about 8½ in. in length without the tail, which is fully 6 in. long, besides being apparently lengthened by its long hair. It is brownish-red on the upper parts, and white beneath; the color changes more or less in winter to a grayish-brown, and in northern countries to gray, and even to white. The long hairs which fringe the ears and are drawn up in to a fine point, are longer in winter than in summer. The common squirrel is widely distributed over the northern parts of the old world, and is plentiful in England, and in some of the southern parts of Scotland, into which, however, it is said to have been introduced. It is generally protected and its presence desired in the vicinity of mansions; although it often does considerable injury in plantations by gnawing off the top shoots of trees, particularly of firs and pines. Morning is generally the time of the squirrel's greatest activity, except in winter, when it prefers the warmest hours. Although numbers are often seen together, they live mostly in pairs, which seem to continue attached throughout life. The squirrel makes a beautiful nest of moss, twigs, and dry leaves, curiously interwoven, most frequently in the fork of a tree at a considerable height from the ground. Here the young are produced, three, four, or five at a birth, in the middle of summer. They continue with their parents till the spring of next year. The winter hoards of the squirrel, containing nuts, beech-mast, grain, and the like, are usually in holes in the ground about the roots of trees, not far from its ordinary abode, the same pair of squirrels having often a number of these hoards. The seeds of firs form a very considerable part of the winter-food of squirrels, and to obtain them, the scales are gnawed away from the cones. The squirrel is easily tamed, and is an amusing pet. It is almost in constant motion, except when asleep.—The only other European species is the ALPINE SQUIRREL (*S. alpinus*), a native of the Alps and Pyrenees, about the same size with the common squirrel, deep brown, speckled with yellowish white.—North America abounds in species of squirrels. The GRAY SQUIRREL (*S. migratorius*) occurs in the northern parts of the United States, and as far north as Hudson's bay. It is much larger than the European squirrel, the whole length with the tail being nearly two feet. It is usually light gray, with yellowish-brown head, and longitudinal stripes of yellowish brown, but it is often found almost entirely black. Its habits are very similar to those of the common squirrel, but it is more gregarious. Gray squirrels sometimes visit corn-fields in large numbers, and make great devastation. In Pennsylvania an old law gave a reward of threepence a head for every squirrel destroyed, and in the year 1749 no smaller a sum than £8,000 was paid out of the treasury on this account, so that 640,000 squirrels must have been killed. Hosts of this species of squirrels sometimes leave their native woods, and migrate like the lemming (q.v.) of northern Europe, whether urged by scarcity of food or through some other unknown impulse. These migrations usually occur in autumn, and are regarded with great horror by farmers. The squirrels advance in a straight course; mountains are no impediment, and although they swim with difficulty, they cross large rivers and narrow bays of lakes.—The CAROLINA GRAY SQUIRREL (*S. Carolinensis*) is a rather smaller species, abundant in the south-eastern parts of the United States, where its flesh is highly esteemed. A number of other species are found in different parts of North America, and very beautiful species occur in tropical countries, some of which live mostly in palms.—Of ground squirrels, several species are natives of North America, of which the best known is the CHIPPING SQUIRREL, HACKEE, or CHIPMUNK (*tamias Lysteri*), abundant in almost all the eastern parts of the United States, and as far as 50° n. lat. Its length, with the tail, is fully ten inches; the general color gray, longitudinally striped with black and yellowish white. It derives its name from its *chipping* or chattering cry, which is like that of a young chicken. It seldom ascends trees: and is not troublesome to the farmer, as it does not attack standing corn, but gleans the fields, and feeds on fallen nuts in the woods. It burrows near the roots of trees, and several squirrels generally inhabit one burrow, which is deep and winding, and in which stores are laid up for winter use. In carrying nuts or other food to its retreat, it makes use of its cheek-pouches, cramming and distending them to the utmost.—A very similar species (*T. striatus*) inhabits Siberia. See *illus.*, RODENTIA, vol. XII.

The fur of some of the American squirrels is an article of commerce. It is one of the cheapest kinds of fur.

SQUITCH. See COUCH GRASS.

S'RÂDDHA (from the Sanskrit *s'râddhâ*, faith, belief) is the name of the funeral ceremony of the Hindus, in which balls of food, and water, are offered to the deceased ancestors of the sacrificer, or to the *pitr'is* or manes collectively. It is especially performed for a parent recently deceased, or for three paternal ancestors, and is supposed necessary to secure the ascent and residence of the souls of the deceased in a world appropriated to the manes. But this ceremony is observed also on occasions of rejoicing as well as of mourning; and hence various S'râddhas are enumerated—viz.: 1. S'râddhas which are *constant*, or the daily offerings to the manes in general, and those offered on the eighth lunation of every month; 2. S'râddhas which are *occasional*, as those for a

relative recently deceased, or those to be performed on various domestic occurrences, as the birth of a son, etc.; and 3. *S'râddhas* which are *voluntary*, performed for a special object, such as the hope of religious merit, etc. The proper seasons for the worship of the manes collectively are the dark fortnight or period of the moon's wane, the day of new moon, the summer and winter solstices, eclipses, etc. The presentation of the ball of food to the deceased, and to his progenitors in both lines, is the office of the nearest male relative, and is the test and title of his claim to the inheritance.—See for further detail, H. H. Wilson's *Glossary of Judicial and Revenue Terms* (Lond. 1855), under *S'râddha*.

SRĀVAKA (from the Sanskrit *s'ru*, to hear) is the name of the disciples of Buddha, who, through the "hearing" of his doctrine, and by practicing the four great Buddhist truths, attain to the qualification of an arhat, or Buddhist saint. From among the number of the disciples of Buddha, 80 are called the *mahās'râvakas*, or the great *s'râvakas*. The *s'râvakas* are entitled to the predicate *âryushmat*, or "one possessed of (long) life."

SRUTI (from the Sanskrit *s'ru*, hear, hence, literally, the hearing, or that which is heard) is, in Sanskrit literature, the technical term for all those works which are considered to have been revealed by a deity. It applies, therefore, properly speaking, only to the Mantra and Brâhmana portion of the Vedas; but at a later period, it is applied likewise, if not especially, to the Upanishads. See **VEDA**.

SS, COLLAR OF, a collar composed of a series of the letter S in gold, either linked together or set in close order, on a blue and white ribbon, with the ends connected by two buckles and a trefoil-shaped link, from which hangs a jewel. Such collars have been much worn in England by persons holding great offices in the state, as well as by the gentry of various ranks, from esquires upward. They are of frequent occurrence on sculptured monuments; but the origin of the device has not been satisfactorily explained. Among the numerous conjectures which have been formed regarding its meaning, one is, that the letter S stands for "*souveraigne*," the favorite motto of Henry IV.; others have suggested "*seneschal*;" and M. Planché hints that it may, with equal probability, owe its origin to the swan of the De Bohuns, that badge being found in one of the earliest examples of this collar (1402), pendent round the neck of the poet Gower, in St. Saviour's church, Southwark. The collar had, without doubt, originally a Lancastrian character. Collars of SS are still worn, with certain recognized distinctions, by the lords chief justices, the lord chief baron of the exchequer, the lord mayor of London, the heralds, and the sergeants-at-arms.

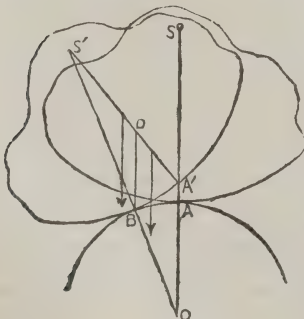
STAAL, MARGUERITE JEANNE CORDIER DE LAUNAY, Baroness de, 1684-1750; b. Paris; lady in waiting to the duchess of Maine, with whom she took part in a conspiracy against the duke of Orleans. She was imprisoned in the Bastille, 1718-20. She married baron de Staal in 1735. Her *Memoirs* are well known.

STABAT MATER, a celebrated Latin hymn on the crucifixion, beginning

Stabat mater dolorosa
Juxta crucem lacrimosa
Dum pendebat filius.

The *Stabat Mater* forms part of the service of the Roman Catholic church during passion-week. Its authorship has been assigned to Jacopone, a Franciscan, who flourished in the 13th century. It has been set to music by many composers of eminence. Pergolese's *Stabat Mater*, written by that eminent musician on his death-bed, is justly celebrated for its pathos and expression. Rossini's more secular *Stabat Mater* is also well known to all lovers of music.

STABILITY AND INSTABILITY. When a body rests upon a surface in such a manner that a vertical from its center of gravity falls within the largest polygon which can be formed by joining the various points of contact of base and surface, it will stand; but if the contrary is the case, it will fall, unless extraneously supported. If the base



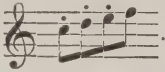
of the body be a plane, and the supporting surface convex, or *vice versâ*, or if both base and surface be convex, there will be only one point of support, and if the body be at rest, its center of gravity must be vertically over the point of contact. Should a body so placed receive a slight impulse, it will either oscillate to and fro, ultimately returning to its original position, or remove further and further from its original position, showing a tendency not to return, or appear indifferent to any one position. In the first case, the body is said to be in *stable*, in the second case, in *unstable*, and in the third, in *neutral* equilibrium. The fig. shows various illustrations of these three species. It will appear at once that the predetermining cause of equilibrium being of one rather than of another of these species, is the tendency of the center of gravity of every body to seek a lower position. In stable equilibrium the center of gravity of the body may, and in unstable equilibrium may not, attain a lower position, while in neutral equilibrium its


position continues unaltered. In illustration of the mode in which the species of equilibrium possessed by a body which has received a slight impulse is determined, let us take the case of a body with a spherical base resting upon a spherical surface (as in fig.); let S and O be the centers of the spherical surfaces respectively, and let A be their point of contact (the center of gravity being consequently in the line SA, or in it produced toward S, and after displacement, in the line S'A', produced if necessary), let the new position of S, after the body has been slightly displaced, be S', and the new point of contact B; join OS, OS', S'A', and draw BD vertically, that is, parallel to OC. Then


$A'D : A'S' :: OB : OS'$, or $A'D = \frac{A'S' \times OB}{OS'}$, that is, $A'D$ = the product of the radii of the two surfaces divided by their sum. Now should the center of gravity of the displaced body fall between D and A', it will have a moment round B tending to restore the body to its former position (*stable equilibrium*); should the center of gravity be beyond D from A', its moment round B will tend to increase the displacement (*unstable equilibrium*); while, if it fall in the line BD, it will still be above the point of contact, as it was at first, and there will be no tendency either to return to, or to move further from, the original position (*neutral equilibrium*). These conditions may be briefly expressed by the following formulæ, in which R is the radius of the supporting surface, r of the spherical base of the body, and X the distance of the center of gravity from the point A; when equilibrium is stable, X is less than $\frac{R \times r}{R + r}$; when unstable, X is greater than $\frac{R \times r}{R + r}$; and when

neutral, $X = \frac{R \times r}{R + r}$. From these formulæ, the conditions of equilibrium of a body, with a spherical base on a plane surface can be at once deduced by making $R = \infty$, the three species of equilibrium being then represented in order by X less than r , X greater than r , and $X = r$; the simplest illustrations of these being respectively a segment of a sphere, a tall cone on a spherical base, and a sphere.

STACCA' TO (Ital. detached), in music, a term implying a detached, abrupt mode of performance. A certain amount of time is subtracted from the proper value of any note played staccato, and a rest substituted. A dot placed over a note indicates that it

is to be played staccato: . A dash implies a greater degree of staccato:

, and a very slight degree of staccato is expressed by uniting the dot

with the slur: ; the slur being the sign of a *legato* expression, the converse of staccato.

STA' CHYS, a genus of plants of the natural order *labiatæ*, containing a great number of species, mostly European, having a ten-ribbed calyx, with five nearly equal teeth, the upper lip of the corolla entire, and the lower lip three-lobed. Several species are natives of Britain. *S. sylvatica* is very common in shady places, a coarse, herbaceous plant, sometimes called *hedge nettle*, with stem 2 to 3 feet high, ovate heart-shaped leaves on long stalks, whorls of purple flowers, and unpleasant smell. *S. palustris* is another very common British species growing in moist places, and sometimes proving a very troublesome weed in meadows. The plant was formerly used as a vulnerary, and has therefore the English name *woundwort*. Several species are not unfrequently to be seen in flower-gardens. To this genus some botanists refer the COMMON BETONY or WOOD BETONY (*S. betonica* or *betonica officinalis*), plentiful in woods and thickets in the southern parts of Britain, a plant one or two feet high, with hairy stem, oblong heart-shaped leaves, whorls of purple or white flowers, and a fetid smell. It was formerly much used in medicine. The roots in small doses, are emetic and aperient.

STADE, a small but very ancient t., formerly fortified, in Prussian Hanover, near the mouth of the Schwinge, a tributary of the Elbe. Pop., abt. 9000.

The *Stade dues* were a toll or duty which used to be charged by the Hanoverian government on all merchandise carried up the Elbe to Hamburg. The original duties, as regulated by a treaty of date 1691, were comparatively light, but they had been gradually increased until they brought to Hanover a revenue of \$200,000. After several modifications in 1844 and 1854, this vexatious toll was finally abolished in 1861, Hanover receiving a compensation equivalent to \$150,000 annually, of which Great Britain paid one-third, another third was contributed by Hamburg, and the remaining third divided proportionally among the other countries that traded to the Elbe.

STA'DIUM, the course set apart for foot-races and all the other games excepting horse-racing, which were wont to be celebrated at Olympia and other places in Greece; the horse and chariot races being held in the *hippodrome* (q.v.). The stadium was of the

same form as the hippodrome, and the arrangement of the spectators was similar. The distance between the starting point and the goal was, in the Olympic stadium, about 600 Greek feet, and the stadia of other places adopted the dimensions of that at Olympia. This distance of 600 Greek feet was adopted as the chief Greek measure of length, and called a *stadium*. It was equivalent to 625 Roman feet, or 125 Roman paces; hence the Roman mile of 1000 paces, contained exactly 8 stadia.

STADTHOLDER (Ger. *stadthalter*, Dutch *stadhouder*, lieutenant or governor of a province). In the German cantons of Switzerland, the name is given to the second civil officer, who ranks next to the landamman. In the republic of the Seven United Provinces, the chief magistrate or president of the union was called the stadhouder. In the 16th c., when the tyranny of Ferdinand, duke of Alva, governor under Philip II., drove the principal towns into revolt, they chose William, prince of Orange, for their governor, and with the view of letting it be understood that the revolt was not against Philip, but against Alva, they conferred on William no higher title than that of stadhouder. On the assassination* of William in 1584, the provinces of Holland, Zeeland, and Utrecht agreeing to have one stadhouder appointed Maurice of Nassau to that office, which came tacitly to be looked on as hereditary. The stadhouderate thus instituted was considered to be at an end or in abeyance on the extinction of the line of William I., by the death of William III. However, on the triumph of the Orange party over the Republican in 1747, William IV., descended from a collateral branch of the house of Nassau, was proclaimed stadhouder, captain-general, and admiral-in-chief of the Seven United Provinces, those dignities being made hereditary in his family. His son, William V., the seventh stadhouder, was driven from his country by the French in 1795, and resigned his office in 1802; since which time the stadhouderate has never been revived, the Netherlands having, at the congress of Vienna, been formed into a kingdom.

STAËL-HOLSTEIN, ANNE LOUISE GERMAINE NECKER, Baronne de, was born at Paris, April 22, 1766. Her father was the celebrated M. Necker (q.v.) finance minister of Louis XVI., in the times immediately preceding the Revolution. Her mother was a woman of severe character, and from her earliest years subjected her to a discipline almost puritanic in its rigor. The daughter, in consequence, had no very warm attachment for her, but for M. Necker, who softened as he could by his indulgent tenderness the harsh rule of his spouse, she entertained the most ardent affection, regarding him then and always with what was almost an idolatry of fondness and admiration. Her talents were precociously developed, and while yet the merest girl, she would listen with eager and intelligent interest to the conversation of the Parisian *savans* who used to frequent the house of her father. In 1786, she was married to the baron de Staël-Holstein, Swedish minister at Paris, an elderly gentleman, with whom her happiness was probably not great, inasmuch as a few years after, a separation between them took place, two sons and a daughter having been meantime the fruit of their union. In 1788, she issued her first work, *Lettres sur les Ecrits et le Caractère de J. J. Rousseau*, which are rather a passionate eulogy of a girlish idol than a just and discriminating criticism.

Her sympathy with the revolution in its earlier stage of promise was profound, but gave place, as its later enormities were developed, to a reaction of horror, which is vividly set forth in her subsequent *Considérations sur la Révolution Française*. Her grief was extreme on the failure of the attempt to escape on the part of the royal family, and she engaged in a secret scheme for securing them a flight to England. This, however, came to nothing, and she then, along with her father, betook herself to Switzerland, his native country. The news of the king's execution inexpressibly shocked her, and she sought to save the life of the queen by publishing *Réflexions sur le Procès de la Reine, par Une Femme*, which, however, was too late to be effective. In 1795 she published at Lausanne, under the title *Recueil de Morceaux Détachés*, a collection of her juvenile writings; and the year after a treatise *De l'Influence des Passions sur le Bonheur des Individus et des Nations*, a work full of originality and genius. In 1797, order having been re-established under the directory, she was once more in Paris. From the first she distrusted the designs of Napoleon, and her *salon* became the headquarters of the anti-Bonapartist faction. In vain she was offered restitution of two million livres since 1788 due to her father from the royal treasury; she scornfully declined the bribe; and as neither fear nor favor could lead her to disguise her hostility to him, it seemed well for Napoleon to rid himself of her. She was forbidden to live in Paris, and subsequently (1802) exiled from France itself. Meanwhile, she had greatly increased her reputation by the publication of her romance of *Delphine*, and a work, *Sur la Littérature Considérée dans ses Rapports avec l'Etat Moral et Politique des Nations*. She now, for two years, traveled in Italy and in Germany, making at Weimar the acquaintance of Goethe, Schiller, Herder, Wieland, etc. The death of her father in 1804 recalled her to Coppet, in Switzerland. Subsequently she was permitted to return to Paris, and there, in 1807, she published her famous *Corinne, ou l'Italie*, the success of which was instant and immense, and won for her a really European reputation. As a bitter in the sweet of fame, however, fresh difficulties with Napoleon occurred, and she was banished anew to Coppet. Her son, the baron Auguste, then 17 years old, sought to intercede for his mother in a personal interview granted him by the emperor, whose inexorable deliverance on the occasion is too characteristic and amusing to be omitted: "Avec l'exaltation de sa tête,

la manie qu'elle a d'écrire *sur tout et à propos de rien* elle pouvait se faire des prosélytes; j'ai dû y veiller." And in candor it is to be admitted, despite of the shrieks which have ever since been put forth about Napoleon's so-called "ungenerous persecution," that he acted on the dictate of a sound prudential policy. A woman who would keep no terms with him, who was uncompromising and fearless, and an influence by the weight of her genius and reputation, was clearly in Paris, of all places, a phenomenon not to be tolerated by the head of a government such as his, more or less the sport of the hour, as always in its basis precarious. After this, when disgusted with Coppet, where she found herself subjected to a petty surveillance, Mme. de Staël rushed restlessly over Europe to Vienna, Moscow, St. Petersburg, thence through Finland to Stockholm, and afterward to London; where, in 1813, she published her great book, *De l'Allemagne*, which had previously been suppressed in Paris. As the first decisive revelation of the genius of Germany to the French people—somewhat as the earlier writings of Mr. Carlyle revealed it to the reading public of Britain, this may perhaps rank as the most important and influential of her works. Of her various experiences of travel, an interesting record is preserved in her *Dix Année d'Exil*. At the restoration she returned to her beloved Paris; from Louis XVIII. she met with a most gracious reception; and restitution was granted her of the two millions on her father's account before mentioned. Soon after her health failed; she sought its restoration in a visit to Italy in 1816, but without effect, and on July 14, 1817, she died at Paris. She was buried at Coppet; and by her will the fact was revealed that in 1812 she had privately married M. de Rocca, a French officer of hussars, aged 25, which may be looked upon as something of an escapade for a mature matron of 46. In this wedlock she gave birth to a son. M. de Rocca survived her only a few months. On the whole she had scantily been happy, as cursed with the "desires infinite and hopes impossible" which make life little better than a sad unfulfilled longing to many of her peculiar temperament and genius. Her touching wail of "Jamais, jamais, je ne serai jamais aimée comme j'aime" was a cry out of her inmost heart. In this light there may perhaps, seem some element of pathos in this marriage, which looks otherwise a little ridiculous.

Mme. de Staël—all just deduction from her claims being made—must be ranked in the first class of female genius. Without question of her real power and originality, in the combination she presents of such a force of intellect as women have but rarely exhibited, with depth and tenderness of sentiment seeking its natural outlet in a rich and impassioned rhetoric, she may curtly, yet with clearness sufficient, be defined as a sort of Rousseau in petticoats.

Her son published an edition of her works in 18 vols. in 1821, with a biographical notice by Mme. Necker de Saussure. See Norris, *Life and Times of Madame de Staël* (1853).

STAFF, in music, the name given to the five parallel lines and four intermediate spaces on which the characters indicating musical sounds are placed, the degrees of the staff indicating differences of pitch.

STAFF, in a military sense, consists of a body of skilled officers, whose duty it is to combine and give vitality to the movements and mechanical action of the several regiments and drilled bodies composing the force. The distinction between an officer on the staff of an army and a regimental officer is that the latter is concerned with his own regiment alone, while the former deals with his army, or section of an army exceeding a regiment, and regulates the combined action of the several arms and bodies of men. A good staff is all-important to the success of a military enterprise.

The *General Staff* of an army comprises the general in actual command, with the subordinate generals commanding the several divisions and brigades: as assistants to these, the officers of the adjt.-general's department—i.e., the adjt.-general, his deputy, assistants, and deputy-assistants, if the army be large enough to require all. Similarly, the officers of the quartermaster-general's department; the brigade-major; the provost-marshal; and the judge-advocate; and the controller (at the head of the civil departments); the functions of all of whom are described under their respective heads. The head of the general staff of the British army is at present a field-marshal commanding-in-chief, whose head-quarters are at the war office, of which department he is an *ex officio* member. He is responsible for the discipline of the army, and is assisted by the general officers in command of the military districts in England and Scotland, the semi-independent commander-in-chief in Ireland, and the commanders-in-chief in the various foreign possessions and colonies. India forms a nearly independent command, under a commander-in-chief, whose head-quarters are in Bengal. There are subordinate commanders-in-chief in Bombay and Madras; and in each presidency there are several military divisions. A certain period of military service, and certain qualifications, are required in an officer before he can be appointed to the general staff, and a proportion of the posts is given to officers who have passed the staff college. The fact of having passed through it, however, is not held to constitute any claim to a staff appointment.

The *Personal Staff* consists of the aids-de-camp and military secretaries to the respective general officers. These officers are appointed, within certain limits, by the generals whom they serve.

The *Garrison Staff* consists of the officers governing in fortresses and garrisons; as

commandants (q.v.), fort-majors (q.v.), town-adjutants (q.v.), fort-adjutants (q.v.), and garrison-adjutants.

The *Civil or Departmental Staff* includes those non-combatants officers who have to provide for the daily requirements of the troops. These are the commissaries for supplies and stores, chaplains, medical and veterinary departments. These departments are described under their several names.

The *Recruiting Staff* consists of an inspector-general (at the war office), and of the officers of the several brigade depots. The *Pensioner Staff* includes only the staff-officers of the enrolled force. The *Regimental Staff* includes the col., lieutenant-col., adjutant paymaster, quartermaster, inspector of musketry, and medical officers. See RECRUITING, REGIMENT.

In the French and most continental armies, the staff is divided into the *état-major*, or general staff and the *intendance*, under an *intendant-général*, which comprises all the civil departments. There is a regimental staff in addition. The want of concentration of the civil departments, often felt in the British service, led to the creation, in 1869, of the control department, subsequently split into two branches, the commissariat (q.v.) and the ordnance store departments. See INTENDANT.

In the navy, the staff of a fleet consists of the flag-officers (q.v.), the flag-lieutenants (q.v.), and secretaries; also of the inspector-general of hospitals (see MEDICAL DEPARTMENT, NAVY), and an inspector of machinery.

STAFFA, a celebrated islet on the west of Scotland, lies about 7 m. off the w. coast of Mull. It forms an uneven tableland, rising at its highest to 144 ft. above the water, $1\frac{1}{2}$ m. in circumference, and oval in shape. In the north-east, in the lee of the prevailing winds, is a tract of low shore, stretching out in beaches, and forming a landing-place. The other parts of the coast are girt with cliffs of from 84 to 112 ft. high. Regarded in sections, the rocks show themselves to be of three kinds—conglomerated tufa forming the basement; columnar basalt, arranged in colonnades, which form the façades and the walls of the chief caves; and amorphous basalt, overlying the columnar basalt, but pierced here and there by the ends of columns and by angular blocks. The most remarkable feature of the island is Fingal's or the Great Cave, the entrance to which is formed by columnar ranges on each side, supporting a lofty arch. The entrance is 33 ft. wide, and 65 ft. high, and the length of the cave is 212 feet. The floor of this marvelous chamber is the sea, which throws up flashing and many-colored lights against the pendant columns, whitened with calcareous stalagmite, which form the roof, and against the pillared walls of the cave.

STAFF COLLEGE, is an English institution founded in 1858, about two m. from Sandhurst, for the purpose of giving higher instruction to 30 (increased in 1870 to 40) officers aspiring to appointments on the staff. It thus took the place, though more effectively, of the old senior class at the royal military college. To be entitled to compete for entrance, an officer must have been five years in active service, must have passed the qualifying examination for a captaincy, and must have the recommendation of his commanding officer. A very serious examination decides which among the competitors shall be admitted to the college, one only being eligible from any battalion. While at college, the students receive their regimental pay, and the whole educational charges (about £8000 annually) are borne by the public. The course lasts two years. At the end of each year, there is an examination, not competitive. After passing the staff college, the officer is attached for duty, for a short period, to each of the arms with which he may not have already served. He then becomes eligible for appointment to the staff as opportunity may occur.

STAFF CORPS. During the wars of Wellington, the generals and staff officers were aided by a staff corps composed of intelligent officers and men who performed camp duties, made reconnaissances, and executed other necessary labors for which regimental officers or soldiers were unsuited. This corps died out after the peace. After the Crimean war, there were three staff corps—the commissariat staff corps, army hospital corps, and military store staff corps—which consisted of artificers, laborers, and orderlies, to aid in the work of their respective departments—as butchers, wardmasters, armorers, copyists, &c. The first and last were merged in 1870 into the army service corps. S. C. is also the name given to the English officers serving on the permanent Indian establishment.

STAFFORD, a co. in central Kansas, drained by the Arkansas river in the n.w., and intersected by the Atchison, Topeka and Santa Fé railroad; 792 sq.m.; pop. '90, 8520, chiefly of American birth, with colored. It consists of level plains, fertile by the water courses. Co. seat, St. John.

STAFFORD, a co. in n.e. Virginia, having the Potomac river for its e. boundary, the Rappahannock on the s.w., drained also by Acquia creek; 245 sq.m.; pop. '90, 7362, chiefly of American birth, with colored. It is intersected by the Richmond, Fredericksburg and Potomac railroad. Its surface is hilly and well timbered, lumber being the principal source of revenue. The soil is moderately fertile and richer near the Potomac river. Gold is found, and granite and freestone are quarried for building pur-

poses. Live stock is raised; other agricultural products are grain, tobacco, and wool. Co. seat, Stafford.

STAFFORD, an inland co. of England, bounded on the w. and n.w. by Shropshire and Cheshire, has an area of 732,434 acres, and a pop., '91, 1,083,273. The most elevated portion of the county is the n. where wild moorlands in long ridges, separated by deeply cut valleys, extend from n.w. to s.e., and subside as they near the valley of the Trent. The surface is low and undulating in the midland regions, but becomes hilly again in the south. New red sandstone occupies the whole of the central parts; the Pottery coal-field occupies the n., and the Dudley coal-field, remarkable also for its abundant and rich iron ores, occupies the south. The Trent, flowing first s.w. through the county, then n.e. along its eastern border, is the chief river. The climate is cold and humid, much of the soil is clayey, and agriculture is in a backward condition. Its manufactures, however, are extensive and varied, including cutlery and iron-ware, pottery, shoes, glass, and cotton, silk and leather goods. The county of Stafford returns seven members to the house of commons.

STAFFORD, the co. t. of Staffordshire, stands on the Sow, 29 m. n.n.w. of Birmingham. The usual municipal institutions of county towns are the chief buildings, and there are two fine and partly ancient parochial churches. Tanning, cutlery, and the manufacture of shoes are the chief branches of industry. Stafford sends one member to the house of commons. Pop. '91, 20,270.

STAFFORD, HENRY, Duke of Buckingham, 1440-83; b. England; assumed the title in 1460. He was one of the most powerful of the adherents of the duke of Gloucester, afterward Richard III., while the latter, then protector, was conspiring to seize the throne. He assisted Richard in his efforts against earl Rivers and lord Gray, which resulted in the destruction of those noblemen; and received as a reward for his services the office of chief-justice and constable of the royal castles in Wales, and later that of lord high constable of England. But he afterward joined the Lancastrians, and being betrayed to Richard, was captured, attainted, and suffered death on the scaffold at Salisbury, Nov. 1, 1483.

STAFFORD, WILLIAM HOWARD, Viscount, 1612-80; b. England, and educated as a Roman Catholic. In 1634 married a sister of the 13th baron Stafford, and on the latter's death, being then sir William Stafford, assumed his title. His claim to this through his wife was afterward disputed, but finally decided in his favor, and a new creation was made by the king, declaring him baron and afterward viscount Stafford. The civil war found Stafford a firm adherent of the king, but he changed his course so far after the restoration as to frequently oppose the royal will from his place in the house of peers. In 1678 Stafford was one of those denounced by the infamous Titus Oates as a conspirator in the pretended popish plot. He was accordingly arrested, with four other noblemen similarly accused, and committed to the Tower. He was impeached on a charge of high treason, Dec., 1678, and in the following November the impeachment trial began before the house of lords under the presidency of sir Heneage Finch, afterward the earl of Nottingham. Despite a spirited defense against suborned testimony, Stafford was found guilty. He was publicly executed on Tower hill, Dec. 29, 1680, to the last protesting his innocence of act or intent to conspire against his sovereign. King James created his widow a countess in her own right; and James II. made his eldest son earl of Stafford in 1688, a title which lapsed in 1762. In 1824 the act of attainder was reversed by parliament, and the following year sir George William Jennings, bart., was recognized as baron Stafford.

STAG, a name familiarly given to a person who applies for an allocation of shares in a joint-stock concern, with a view of selling the allocation letter to another party for a small consideration. When no such consideration or premium is obtainable, the *stag* does not pay the deposit, which by his application he had become bound to do, and relinquishes any further interest in the undertaking. Persons acting thus, however, are liable to prosecution and exposure as defaulters. During the great railway mania of 1846 the stock market was thronged with stags.

STAG, or RED DEER, *Cervus elephas*, a species of deer (q.v.) with round antlers, which have a snag at the base in front. The female has no horns, and is called a *hind*. The young male during the first year acquires mere knobs in place of horns. In the second year they are longer and pointed, when the animal is called a *brocket*. The branching of the horns increases every year till the sixth, when the name *hart* (q.v.) begins to be applied. After this the age is no longer indicated by an increased number of branches, but the antlers become larger and thicker, their furrows deeper, and the *butt* at the base more projecting. The oldest stags have seldom more than 10 or 12 branches, although an instance has occurred of 33 on each antler. A fine stag is 4 ft. or more in height at the shoulder. The color is reddish brown in summer, the rump pale; in winter it is brownish gray. The female is smaller than the male. The young is at first spotted with white. The stag is a native of Europe and the north of Asia. It was anciently common in all parts of Britain, but is now almost extinct except in the Highlands of Scotland, where large herds still exist, particularly on the Grampians, and the sport of deer-stalking is pursued, in which the rifle is now generally used; although in former times the stag was hunted, hounds of a peculiar breed called staghounds (q.v.) being employed for the purpose. The forest laws of England were extremely strict for

the preservation of this noble game, the unauthorized killing of a stag being even a more unpardonable offense than the killing of a man. The stag feeds on the buds and young shoots of trees and on grass, or in the severe weather of winter on bark and mosses. The speed of the stag is very great. It has also great powers of swimming, and has been known to swim 10 miles. When hard pressed by hunters it turns to bay, and is not approached without danger. At the pairing season, which is in August, even tame stags become so excited that it is not safe to approach them. The domestication of the stag is never very complete. In fighting the stag uses not only its horns, but its fore-feet, with which it gives severe blows to an adversary. The flesh of the stag is not so good as that of the fallow deer.—Among the species of deer most nearly allied to the stag are the wapiti (q.v.), an American species, and several species belonging to the warmer parts of Asia and the north of Africa. They all have round branched antlers, with a basal snag in front, and a tuft of hair on the hind legs above the middle of the metatarsus.

STAG BEETLE, *Lucanus*, a genus of coleopterous insects, of the family *lamelli-cornes*, remarkable for the large projecting mandibles of the males, which have large denticulations, and somewhat resemble stags' horns. The antennæ terminate in a club composed of many leaflets, disposed on an axis like the teeth of a comb. The **COMMON STAG BEETLE** (*L. cervus*) is one of the largest of British insects, the males being fully two in. long. It flies about in the evening in the middle of summer, chiefly frequenting oak woods. The larva feeds on the wood of the oak and willow, and is injurious to the trunks of trees, into which it eats its way very rapidly. It is supposed to be the *cossus* of the ancient Romans, much esteemed by them as a delicacy. It lives for several years before undergoing its transformations. In its perfect state, the stag beetle is a formidable-looking insect, and its powerful mandibles are capable of inflicting a pretty severe bite, if it is incautiously seized, but it is not venomous. Some of the tropical stag beetles are remarkable for their brilliancy of color.

STAGE. See THEATER.

STAGER, ANSON, 1825-85; b. Ontario co., N. Y.; d. Chicago; engaged in printing when a boy, but early became interested in the building of telegraphs. Under the direction of Henry O'Reilly, he held an office at Lancaster, Penn., 1846, where he was the first to economize batteries by charging many wires at the same time from the same source. He was also the originator of the system of connecting long lines of telegraphs, thus saving the risk attached to the frequent repetitions of messages. He was the first general supt. of the New York and Missouri valley telegraph co., connecting Buffalo, N. Y., with Louisville, Ky. Upon the organization of the Western Union co., he became its general supt.; was the originator of the present elaborate and excellent system of railroad telegraphs in the w. and n. w. During the civil war, he had charge of the telegraph wires in O., Ind., and Ill.; organized and had control of the military telegraph at Washington; was appointed chief of the U. S. military telegraph throughout the country, 1861. He was also placed in charge of the cipher correspondence, and invented a system of cryptography which completely baffled the confederate telegraphers. He was breveted brig.-gen. for his meritorious and distinguished services. He afterward resided at Cleveland and Chicago, in charge of the central division of the Western Union co. He was prominently connected with the electric light manufacture, and with the development of the telephone interests in Chicago.

STAGGERS is a popular term applied to several diseases of horses. Mad or sleepy staggers is inflammation of the brain, a rare but fatal complaint, marked by high fever, a staggering gait, violent convulsive struggling, usually terminating in stupor; and treated by bleeding, full doses of physic, and cold applied to the head. Grass or stomach staggers is acute indigestion, usually occasioned by overloading the stomach and bowels with tough hard grass, vetches, or clover, a full meal of wheat, or other indigestible food. It is most common in summer and autumn, is indicated by impaired appetite, distended abdomen, dull aspect, unsteady gait; and is remedied by full doses of purgative medicine, such as six drams of aloes and a dram of calomel rubbed down together, and given in a quart of thin well-boiled gruel. Frequent clysters, with hand-rubbing and hot water to the belly, are likewise useful. Where the dullness increases, stimulants should be freely given. See HYDATID.

STAGHOUND, a large and powerful kind of hound (q.v.), formerly much used in England for hunting the stag, but now almost extinct. It is supposed to be a breed of the old English southern hound. In scent, it is almost equal to the bloodhound; in fleetness, it is inferior to the foxhound. It has great power of endurance, and has been known to run 50 m. after a stag. It is also courageous, and does not hesitate to attack the stag when at bay.

STAGIRA (ancient name for Stavros), a t. in s.e. Macedonia, on the gulf of Contessa, otherwise called the gulf of Orphano, the *Sinus Strymonicus* of the ancients. According to Thucydides it was founded by a colony from Andros, and is situated on the upper shore of the peninsula of mount Athos, near its junction with the main-land. It is in the district of Chalcidice, and is celebrated as the birthplace of Aristotle. It declined during the Peloponnesian war. The surrounding country is noted for its fertility, producing corn, wine, oil, and fruit.

STAHEL, JULIUS, b. Hungary, 1825. He served in the Austrian army, but joined the Hungarian patriots, and was an *aide* to Görgei. After the failure of the movement, he visited Germany and England, and finally came to New York and became a journalist. He was brig.-gen. of vols., 1861, and commanded a division under Sigel. In 1866 and 1877 he was U.S. consul at Yokohama, Japan.

STAHL, FRIEDRICH JULIUS, 1802-61; b. Munich; prof. of law at Erlangen, Wurzburg, and Berlin. He served successively in the Prussian chamber of deputies, the Erfurt parliament, and the upper house of the Prussian legislature. He was a prominent member of the Lutheran party, and one of the founders of the German church diet. In his chief work, *Philosophie des Rechts*, he advocates a "Christian state," which shall support the church by the secular arm.

STAHL, GEORG ERNST, a celebrated German physician and chemist, was born at Anspach, October 21, 1660, studied medicine at Jena, and after practicing successfully for some time, was called, in 1694, to the chair of medicine, anatomy, and chemistry, in the newly-founded university of Halle; whence he removed to Berlin in 1716, where he was appointed physician to the king of Prussia. He was a member of the Berlin Academy, and died in that city May 14, 1734. According to Blumenbach, Stahl is to be considered as one of the greatest and most profound physicians the world has ever seen, though the mysticism with which his works are imbued is to be reprehended. Stahl's system of medicine, which combined the physiology of Van Helmont (see HELMONT, VAN) with the psychology of Descartes, is founded on the supposition of the existence of a mysterious force residing in, but independent of, and superior to matter; this force, the *anima* (or "soul"), not only forms the body, but directs it in the exercise of all its functions, and this, too, sometimes unconsciously; though the way in which this influence is exercised he does not explain. Being subject to error by nature, the "anima," by negligence or maladroitness, originates diseases in the body, which it then attempts to cure, through the functional action of the various parts. Stahl held that art ought only to commence where nature had ended, and to be useful, it should follow a similar course of action; he was also of opinion that plethora, either local or general, was one of the chief causes of disease. His system of therapeutics corresponded with his pathological principles, and was confined mostly to bleeding and the use of mild laxatives. His psychological theory of the connection between the soul and body led him into a discussion with Leibnitz (who had falsely charged him with propounding materialism), from which he emerged victorious on the essential points of their respective theories; though Leibnitz had the advantage in matters of detail. Subsequent physiologists have made Stahl's opinions the object of ridicule, though his doctrine of the "anima" is, under the name of "vital principle" and "nature," generally adopted at the present day; but his supercilious contempt for chemistry as a medical agent has long ceased to be generally upheld. Nevertheless, Stahl was one of the ablest chemists of his time, destroyed, in his usual trenchant style, numberless absurd opinions which had found their way into the science, and propounded the first theory of combustion (see PHLOGISTON), which was universally accepted till the time of Lavoisier (q.v.). His works, according to Haller, number 250, but the chief are—*Theoria Medica vera* (Halle, 1707, 1708, 1737), which contains his medical theory, and *Zymotechnia Fundamentalis, seu Fermentationis Theoria Generalis* (Halle, 1697), in which his chemical opinions are set forth. An account of his opinions is found in Haller's *Bibliotheca Medicinæ Practicæ*, vol. iii.; Sprengel's *Histoire de la Médecine*; A. Lemoine's *le Vitalisme et l'Animisme de Stahl* (Paris, 1864), and numerous other works.

STAIGG, RICHARD M., b. England, in 1817; came to this country while young and worked as a mechanic in Newport, R. I., where he had the *entrée* of the studios of Jane Stuart and Alston, and beginning there the study of miniature painting, rose rapidly to eminence in that profession. He painted the portraits of Allston, Everett, and Webster, the latter now preserved in the rooms of the Historical society in Boston. His genre pictures and coast scenes are especially prized; among them "News from the War," "The Crossing Sweeper," and "The Love Letter." He d. 1881.

STAINED GLASS. See GLASS.

STAINER, Sir JOHN, b. England, 1840; studied music at Oxford, where he was organist of Magdalen college and of the university church. He became organist of St. Paul's, London, 1872-1888. He published his *Theory of Harmony* in 1871. He is a fine instrumentalist, and has composed many anthems and songs. He was knighted in 1888 and in 1889 was prof. of music at Oxford university.

STAINS FOR WOOD. A variety of stains have recently been invented for the purpose of giving to the cheaper kinds of wood, such as deal, etc., the appearance of the more costly kinds. These are chiefly solutions of certain metallic salts, combined with vegetable infusions.

STAIR, LORD. See DALRYMPLE FAMILY.

STAIRCASE. This feature, now so important in all houses, was of small note till about the time of queen Elizabeth. Previously, stairs were all constructed on the circular pian, revolving round a central axis or newel, and were called turret or corkscrew stairs. During the 16th and 17th centuries, staircases with wide straight flights were

first introduced, and were made leading features in the mansions of the Elizabethan style. They had usually massive oak balusters with carved pedestals, and were ornamented with carved panels, pendants, etc.

STAKE NETS. See **SALMON**.

STALACTITES AND **STALAGMITES** are found in caves and other places where water charged with carbonate of lime is subject to evaporation. Water impregnated with carbonic acid is able to dissolve lime, and as all rain and surface water contains more or less carbonic acid, it takes up in its passage through the earth to the roofs of caves a certain amount of lime. When the water is exposed on the roof or floor of the cave, evaporation takes place, and so both the bulk of the water and its solvent power are reduced, and a thin pellicle of solid carbonate of lime is deposited. When this takes place on the roof of the cave, long icicle-like pendants are formed, which are called stalactites; and when the water drops upon the floor, a stalagmitic layer is formed, which rises at the points where the largest supply of material exists, in the form of pillars to meet the overhanging stalactites. In some caves, the descending and ascending points have met and formed a series of natural columns as if supporting the roof. The amount of the deposition is very great in some caves, and the wonderful variety and singular groupings of the stalactites give them a peculiar beauty. The caves most remarkable in this way are the cave of Adelsberg in Styria, the grotto of Antiparos in the Grecian Archipelago, Mammoth Cave in the United States, and the caves of the peak in Derbyshire.

STALIMNE. See **LEMNOS**.

STALWARTS, a term belonging to the vocabulary of American politics, and first generally used in the spring of 1881. In that year, President Garfield, setting aside the usual precedent, appointed Mr. W. H. Robertson Collector of the port of New York, without consulting the New York senators, and in opposition to their known preferences. The senators in question, Messrs. Roscoe Conkling and Thomas C. Platt, believing this act to have been inspired by Mr. Blaine, then secretary of state, who was personally unfriendly to Mr. Conkling, and regarding it as a direct blow at their influence in the state, resigned from the Senate. Their friends in the New York legislature at once sought to have them re-elected as a "vindication"—an attempt that was vigorously opposed by the partisans of the administration. A long and intensely bitter fight ensued. Those who tried to re-elect Messrs. Conkling and Platt, received the name of Stalwarts, while their opponents were dubbed "Half Breeds" (q.v.), the latter name implying that they were not thoroughly imbued with the party traditions. The immediate result of the contest was the triumph of the Half Breeds who secured the election of Elbridge G. Lapham and Warner Miller in the place of Messrs. Platt and Conkling. The indirect results were momentous and far-reaching. To the bitterness engendered by the contest was due the assassination of President Garfield by the miserable Guiteau; while the division in the party led to the election of Grover Cleveland as democratic governor of the state in the following year by a majority of some 200,000 votes—the largest ever given to a gubernatorial candidate, and one which at once made Mr. Cleveland an aspirant for the presidency. To the defection of the Stalwarts in New York in 1884, Mr. Blaine's loss of that state at the presidential election is attributed by many. The term Stalwart at the present time receives a somewhat wider application than formerly. It is now used of any strict partisan, and is thus a term antithetical to Mugwump (q.v.). See **PARTY NAMES**.

STALYBRIDGE, a market-t. and parliamentary and municipal borough, partly in Lancashire and partly in Cheshire, stands on the Tame, eight m. e. of Manchester. It is remarkable chiefly for its cotton manufactures. The print-works, iron-foundries, and machine-shops are also numerous and important. Free communication by railway is afforded in every direction. Pop. '91, 26,783.

STAMBOUL. See **CONSTANTINOPLE**.

STAMBULOFF, STEPHEN. A Bulgarian statesman, born in 1853. In the Russo-Turkish war of 1877-78, he served in the Russian army. After the election of Alexander I. as Prince of Bulgaria, he became leader of the Liberal party, and in 1884 president of the Sobranye. His opposition to the projects of Russia was always marked, and as chief minister under Alexander's successor, Ferdinand, he carried out his policy with such energy as to be styled "the Bismarck of Bulgaria." So autocratic, however, did he become as to offend both Prince and people, and in May, 1894, he resigned office. On July 18, 1895, he was assassinated in the streets of Sofia. See the life, by Beaman (1895).

STAMENS are those parts in the flowers of phanerogamous plants which excite the pistil to the formation of the fruit, and thus effect fertilization or fecundation (q.v.). A stamen consists of a receptacle—the *anther*; which contains a dust—the *pollen*—various in color, but generally yellow, and is generally supported on a stalk called the *filament*; the anther being the blade of a metamorphosed leaf, and the filament the leaf-stalk. The filament is, however, sometimes wanting, and the anther is then said to be *sessile*. Each anther generally consists of two cells, forming two lobes, which, before they open to give forth the pollen, are again divided into two

cell-like parts, and at the time of their maturity open by longitudinal clefts, by pores, or by valves, to scatter the pollen, which is conveyed to the stigma either by its own falling, by the wind, or by the insects which seek honey in flowers. See **PISTIL**. The pollen consists of single cells, which are usually free; more rarely, the pollen of each cell is united into a mass, called the *pollen-mass* or *pollinium*, as in the *Orchidæ* and *Asclepiadaceæ*. The stamens are either found along with the pistil in the same flower, and are then arranged around it, in which case the flower is *hermaphrodite*, or they are placed by themselves in separate flowers, which are therefore called *male* flowers. The stamens are sometimes united together, generally by the filaments, which form a tube, and the flower is *monadelphous*; sometimes, by their union, they form two sets, when the flower is *diadelphous*; sometimes three or more, when it is *polyadelphous*; and the filaments are sometimes united with the pistil into a column, from which the anthers spring, as if they grew from the pistil, when the flower is *gynandrous*. See **BOTANY**. The stamens form either one or more whorls, and when in one whorl are either opposite to the petals or alternate with them. The latter is regarded as their normal position. Sometimes, by abortion, there is only one stamen. Being leaf-organs, stamens arise from the axis; but they very frequently grow upon the corolla, so that they seem to derive their origin from it. When the stamens seem to arise from the corolla or from the calyx, they, and also the flower, are said to be *perigynous* (Gr. *peri*, around, and *gyne*, a wife); when they grow from the pistil, they are *epigynous* (Gr. *epi*, upon); and when from beneath it, *hypogynous* (Gr. *hypo*, under). These distinctions have been much made use of, by Jussieu and others, in classification. The transitions of petals into stamens can be easily traced in some flowers, for example, in the water lily. In double flowers, the stamens have been changed into petals. Linnaeus adopted the stamens as the means of his division of plants into classes (see **BOTANY**); but in so far as the classification was founded on their mere number, it was artificial, the number of stamens being various in plants very closely allied. Stamens are among the organs of plants which most frequently display irritability (q. v.). See *illus.*, **BOTANY**, vol. II.

STAMFORD, a town and city in Fairfield co., Conn.; on Long Island sound, and the New York, New Haven, and Hartford railroad; 34 m. e. of New York. The town was settled in 1640, under the jurisdiction of the colony of New Haven; was named in 1642; and subjected itself to the jurisdiction of Connecticut in 1662. The city, comprising four-fifths of the population of the town, was set apart and given a city charter in 1893. It contains a hospital, the Ferguson library, numerous small parks, the town hall, an imposing high school building, electric light and street railroad plants, waterworks supplied from Trinity lake 18 miles distant, and several national and savings banks. The principal manufactures are dye stuffs, iron castings, machinery, shoes, locks, pottery, pianos, billiard tables, drugs, carriages, thread, hats, and pumps. Pop. '90, 15,700.

STAMFORD, an ancient market-t. and a parliamentary and municipal borough of Lincoln, on the Welland, which is navigable hence to the sea, 11 m. n.w. of Peterborough. Agriculture is almost the exclusive pursuit of the inhabitants of the district around, and Stamford is chiefly remarkable for its ancient remains. It first appears in history in 449, when the Britons and Saxons here defeated the Picts and Scots.

STAMMERING AND DEFECTIVE SPEECH. Stammering is an affection of the vocal and enunciative organs, causing a hesitancy and difficulty of utterance, and respecting the nature and the origin of which a variety of different opinions has been entertained. Stammerers themselves often attribute the varying conditions of their impediment to causes which must be purely imaginary, such as the state of the wind, the changes of the moon, etc. There can be no doubt that the impediment is aggravated by depression of spirits, derangement of the digestive organs, physical debility, etc.; but these influences have nothing to do with the primary cause of the infirmity. A nervous dread of speaking is usually associated with stammering; but this is rather the result than the cause of the impediment. If constitutional nervousness were productive of stammering, the number of sufferers would be vastly greater, and it would include a larger proportion of females than of males; whereas the robust sex furnishes by far the greater number of cases; and it is noticeable, besides, that stammerers are not in general persons of weak nerves, otherwise than in connection with the act of speaking. Any physical defect will render a person nervous when the peculiarity is made a subject of observation, and it is in this way only that nervousness is associated with speech in cases of stammering. The strength of this impediment lies in *habit*, in mismanagement of the breath and the organs of utterance, rendered habitual before the development of reason and observation; and the removal of the defect depends on the acquirement of voluntary control over the mechanical agents of speech. The nervousness which unfits the stammerer for self direction gradually subsides as his will attains a mastery over the processes of speech; and perseverance in a discipline of systematic and guarded utterance rarely fails to remove the impediment, and the fear which accompanied it.

The first manifestations of stammering usually take place during the weakness attendant on disease, or after a fall or sudden fright; but sometimes the impediment appears to arise from imitation, and children have been known to be infected by even the most casual example. Thus, when one member or visitor of a family stammers, the younger members of a family are very apt to be similarly affected. From this cause defects of speech run so much in families, that many persons have thought them to be hereditarily transmitted. This, however, is altogether a mistake.

Stammering generally begins about the fourth or fifth year of age; but harshness in checking children, or impatience in connection with messages or lessons, may induce the impediment at a considerable later period. Boys of ten or eleven years of age have been excited into the habit by injudicious hurry and peremptoriness at school. The little stammerer, when he cannot be more directly assisted, should be kindly counseled to take time and speak slowly, and he should by no means be ridiculed or reproved for what he cannot help, and is not taught how to avoid.

The varieties of stammering are so great, that scarcely two cases are found precisely alike. In some there is but little outward manifestation of effort; in others, the futile attempts are painfully demonstrative. The silent straining to speak causes the eyeballs to protrude, and the veins of the face and neck to swell, till relief from apparent choking comes in fitful, ungovernable bursts of sound. In almost all cases the head oscillates loosely on the neck, and is forced upward by the misdirected current of breath; while the larynx, the organ of sound, is from the same cause agitated in continual efforts to ascend, and the voice is consequently abrupt and intermittent, and unnaturally acute. The muscles of the face participate in the general upward action, and sometimes the spasmodic contortions extend over the whole body, causing the stammerer to rock in his chair, or start wildly to his feet. These muscular disturbances arise simply from disordered respiration, and they disappear when the habit of closing the glottis and compressing the organs of articulation is overcome, and the air is allowed to pass freely in or out of the lungs.

The terms stuttering and stammering are often used synonymously, but the former term is properly, or, at least, conveniently, limited to a loose and imperfect action of the organs of articulation, as distinguished from the irregularity of breathing and the convulsive and choking symptoms which invariably accompany stammering. In stuttering, the organs meet and rebound again and again in reiteration of syllables before words can be fully formed. The source of this difficulty lies mainly in the lower jaw. When this organ is brought under control, and the effort of speech is transferred from the mouth to the throat—where all voice is formed—the power of fluency is readily obtained. But stuttering is rarely unaccompanied by some degree of spasmodic stammering, and the two forms of impediment, while theoretically distinct, are generally blended in mutual aggravation.

Stammering is, in nearly every case, perfectly curable, as it seldom arises from organic defect. The means of cure must, however, often be continued for a length of time before the stammerer is free from the danger of relapse. The best time for the cure is undoubtedly the earliest, before the habit has acquired full strength, and before the sufferer has endured the most grievous mortifications and drawbacks of the impediment. But the adult stammerer generally brings to the curative task a higher appreciation of its importance, and a greater care and concentration of effort than the child is capable of; and these qualities almost compensate for the disadvantage of long-established habit. Parents often unwisely defer the attempt to correct impediments of speech, in the hope that the defects will disappear as the child gains strength and reaches riper years. But the hope is very rarely realized; and were it otherwise, the misery of years of impediment, and the hindrance to education which stammering certainly involves, are evils to be avoided by all possible means. With this, as with all habits, "prevention is better than cure;" and stammering would be easily and certainly prevented by timely advice carried out with ordinary care in the nursery.

The means that have been proposed for the cure of stammering have been as various as the theories of the nature of the defect; and sometimes the "cure" has been apparently but little better than the disease. Drawling, singing, interpolations or elisions of letters, speaking with the teeth closed, or with the tongue pressed to the roof of the mouth, sniffing, whistling between words, beating time to utterance, stamping the foot, jerking the body, forks on the tongue, pebbles in the mouth, or tubes fixed between the organs, bands compressing the larynx, and other absurd and uncouth devices, have been, under cover of expedient secrecy, practiced on unhappy stammerers. But the removal of this defect, as above shown, depends on the skillful application of scientific principles, respecting which there is no mystery save that which arises from the little attention that has been paid to the science of speech.

From the preceding account of the nature of stammering, it is almost superfluous to add that the cure of this impediment does not fall within the province of surgery. Yet the barbarous operation of cutting a wedge from the root of the tongue—introduced from Germany about 25 years ago—and the equally futile and cruel operation of excising the tonsils, have been, within no distant date, extensively practiced by surgeons in this country.

The habit of stammering can only be counteracted by the cultivation of a habit of correct speaking; and the latter can only be acquired by studying the processes of speech, the relation of breath to articulate sounds, the positions of the tongue and the other oral organs in molding the outward stream of air; and by a patient application of these principles in slow and watchful exercise. The lungs constitute a pair of bellows, and the mouth, in all its varying shapes, the nozzle of the bellows. The passage of the throat must be kept open, and the breath expelled by means of the ascent of the diaphragm, not by downward pressure of the chest. All sound originates in the throat, and all effort

in speech must be thrown back behind the articulating organs, which must be kept *passive*, yielding to the air, always opening to give it exit, and never resisting it by ascent of the tongue or of the jaw. The head must be held firmly on the neck, to give free play to the attached organs; and the great principle must never be lost sight of that *speech is breath*; and that, while distinctness depends on precision and sharpness of the oral actions, *fluency* depends on the unrestrained emission of the material of speech—the air we breathe.

Besides stammering and stuttering, there are many other forms of vicious articulation, which are rather defects than impediments of speech. The elementary sounds most subject to mispronunciation are those of *r* and *s*, giving rise to the common defects of burring and lisping. Burring consists in vibrating the uvula or the edge of the soft palate, instead of the tip of the tongue; and lisping consists in applying the tongue to the teeth or the gum, so as to intercept the breath, and force it over the sides instead of the center of the tongue. The sound of *l* also is often defective, *w*, *y*, *ng*, or a vowel being substituted for the lingual articulation. Other substitutions of one element for another are common, such as *t*, *d*, and *n*, for *k*, *g*, and *ng*; *s* or *z* for *th*; *s* for *sh*, etc. There are also defects which arise from organic malformation, and require the aid of surgery; as when fissure exists in the palate, and the breath cannot be enclosed behind the lips or tongue, but escapes into the nostrils; when the tongue is too closely tied to the bed of the mouth, and the tip cannot be raised to the palate; when the teeth are so irregular or abnormally numerous as to leave the tongue too little room to act, etc. In some cases the breath escapes into the nostrils when there is no organic cause for the peculiarity, and *r*, *l*, *s*, and other elements are nasally affected, merely from habit. The nasal passages are, in other cases, insufficiently free, and *m*, *n*, and *ng* are scarcely distinguishable from *b*, *d*, and *g*.

There are comparatively few persons who have perfect command over their vocal organs. Speaking, which is in reality an art, is exercised only as an instinct; and thus, as an eminent American author (Dr. Rush) observes, "some men only bleat, bark, whinny, or bray a little better than others." It is some consolation to those who have been compelled by defects to study the art of speech, that they exercise the crowning faculty of man's nature more worthily than others, and thus become, perhaps, better speakers than they would have been without the stimulus of defect or impediment.

Speaking, when the respiration is properly conducted, is one of the most healthful exercises; but violent or long-continued effort is injurious to the chest, when the lungs are not kept well inflated. Frequently, also, under such circumstances, the vocal chords become permanently relaxed, and total loss of voice sometimes ensues.

The acquirement of the power of speaking in infancy is dependent on the possession of hearing, so that deaf children are also mute. Under proper training, however, they may be taught to articulate, as the organs of speech are very rarely imperfect. Children who have been subject to fits or other cerebral affections, or who are deficient in imitative power, are sometimes very backward in learning to speak. In such cases, great care is requisite to direct the early attempts, and prevent the formation of bad habits. Many of the worst forms of defect and impediment owe their origin simply to the want of proper direction in the production of elementary sounds, when the little sufferers have failed to enounce them correctly by natural imitation.

It is unnecessary to enumerate the various English, American, and foreign authors who have propounded conflicting theories of the cause, and schemes for the cure of impediments of speech. Of the systems practiced in this country at the present day, those of Dr. Hunt and Mr. Melville Bell have been most fully published. The views of these authors differ but little, and are in substance the same as those contained in this article.

STAMP ACT. This act was one of those procured from the British parliament by the direct influence of George III., with that design toward oppression which characterized his course with regard to the colonies, and which finally brought about the revolution. It was passed in Mar., 1765, receiving the royal signature on the 22d of that month, and to take effect Nov. 1. Its immediate result was to bring about the assembling of a colonial congress at New York, Oct. 7, 1765; and on the day of its taking effect, bells were tolled, flags were placed at half-mast, and newspapers were put in mourning; while no officials were found courageous enough to enforce the obnoxious law. The act declared that no legal instrument should be valid in the colonies unless it bore the government stamp. On Mar. 18, 1766, it was repealed.

STÄMPFELI, JAKOB, 1820–79; b. Switzerland; studied law, and became a lawyer, and a radical journalist. He was head of the financial department in the council of state in 1846, and represented Bern in the diet in 1847, when he advocated the expulsion of the Jesuits and war with the Roman Catholic cantons. He was president in 1849, 1851, 1856, and 1862; several times vice-president, and minister of war. In 1872 he was one of the Geneva arbitrators under the treaty of Washington.

STAMPING OF METALS. There are different kinds of stamping. The plan adopted for producing coins or medals is described under **MINT**, and the preparation of the dies used, under **DIE-SINKING**. For the ordinary stamped brass-work, so extensively made

In Birmingham, a stamping-machine is employed, of which the essential parts are a *die*, a reverse or counter-die, and a *hammer*. A toothed rack, with arrangement for catching the hammer after it rebounds, is only used for special purposes. The die, which is made of cast-iron or steel, is fixed to the bottom of the stamp, and the reverse is attached to the hammer, which works between two guides. Pieces of thin rolled brass are cut to size, and one placed upon the die; the hammer, with the counter-die, is now raised to a sufficient height by a windlass and rope, or other means, and allowed to fall, and thus force the thin plate into the die. The plates from the first blow are then annealed. Repeated blows and annealings follow until the article is "brought up," slight alterations in the reverse being from time to time required. Sometimes as many as 30 blows are necessary, but 10 or 12 strokes will suffice for an object with a considerable depth of raising. Globular articles are stamped in two or more pieces, and then soldered together.

The stamping process was first adapted to the production of hollow shapes in sheet-iron by Mr. T. Griffiths in 1841; and since then, the manufacture of such goods as dish-covers, basins, and teapots has been improved and extended to a surprising extent. In the case of a dish-cover, for example, a single sheet of iron is brought to the required shape by repeated stampings and burnishings upon a chuck. It is afterward tinned with great ease, there being no joints to interfere with the operation; for the same reason, iron basins stamped out of a single sheet can be readily enameled. The old way of forming these articles by hand-labor was very tedious and clumsy.

German silver is too brittle a metal to be stamped like brass or iron, consequently it has only hitherto been made into small objects, such as spoons and forks, by this process. But the Messrs. Elkington of Birmingham are now making articles of considerable size in this material, by means of a stamping-press worked by hydraulic power. A number of graduated dies are used for one object, each pair coming gradually nearer the desired shape, but none of them making an impression deep enough to strain the metal.

For stamping-machines used in dressing metallic ores, see METALLURGY.

STAMPS, or **STAMP DUTIES**, are taxes imposed in England on all paper whereon private deeds or other instruments of almost any nature are written. It is a convenient mode of raising the public revenue, and was first instituted by a statute of 5 and 6 Will. and Mary, c. 21. The subsequent statutes are varied and complicated, and embrace nearly every kind of legal document.

STANBRIDGE, JOHN, abt. 1450-abt. 1525; b. England; made perpetual fellow of New college, Oxford, 1481. About 1486 he formed a connection with the free school adjoining Magdalen college, which lasted many years, entering as first usher and succeeding John Anwykyl as head master. He was author of the first printed school-books circulated to any extent in England; among them *The Accydence of Mayster Stanbridge's Oone Makynge*, printed in the 15th c., and *Embryon Relimatum sive Vocabularium*, 8 editions, printed by Wynkin de Worde.

STANCHIONS, or **STANCHELS**, upright iron bars fixed in the stonework to protect windows. They are sometimes let into the stone at top and bottom: sometimes at bottom only, and ornamented with fleurs-de-lis, etc., at top.

STANDARD. In its widest sense, a standard is a flag or ensign under which men are united together for some common purpose. The use of the standard as a rallying-point in battle takes us back to remote ages. The Jewish army was marshaled with the aid of standards belonging to the four tribes of Judah, Reuben, Ephraim, and Dan, and the Egyptians had ensigns with representations of their favorite animals. The flag of Persia was white, and, according to Xenophon, bore in his time a golden eagle with expanded wings; it was fixed on a chariot, and thus conveyed to the field of battle. Æschylus, in enumerating the six chiefs who, headed by Polynices, set themselves in battle array against Thebes, describes the device on the standard of each. In the earliest era of Roman history a bundle of hay or fern is said to have been used as a military standard, which was succeeded by bronze or silver figures of animals attached to a staff, of which Pliny enumerates five—the eagle, the wolf, the minotaur, the horse, and the boar. In the second consulship of Marius, 104 B.C., the other animals were laid aside, and only the eagle retained; and down to the time of the later emperors, the eagle, often with a representation of the emperor's head beneath it, continued to be carried with the legion. On the top of the staff was often a figure of Victory or Mars. Each cohort had also an ensign of its own, consisting of a serpent or dragon woven on a square piece of cloth, and elevated on a gilt staff with a cross-bar. Under the Christian emperors, the *labarum* (q.v.) was substituted for the imperial standard. Various standards of great celebrity occur in mediæval history, among which may be enumerated the *flag of the prophet* (q.v.); the standard taken from the Danes by Alfred of England; and the oriflamme, originally belonging to the abbey of St. Denis, and borne by the counts of Vexin, which eventually became the standard of the French kingdom.

In strict language, the term standard is applied exclusively to a particular kind of flag, long in proportion to its depth, tapering toward the fly, and, except when belonging to princes of the blood royal, slit at the end. Each baron, knight, or other commander in feudal times, had a recognized standard, which was distributed among his

followers. The length of the standard varied according to the rank of the bearer. A king's standard was from 8 to 9 yards in length; a duke's, 7 yards; a marquis's, $6\frac{1}{2}$ yards; an earl's, 6 yards; a viscount's, $5\frac{1}{2}$ yards; a baron's, 5 yards; a banneret's, $4\frac{1}{2}$ yards; and a knight's, 4 yards. There was never a complete coat-of-arms on the standard; it generally exhibited the crest or supporter with a device or badge of the owner, and every English standard of the Tudor era had the cross of St. George at the head. Standards were registered by the heralds, and the charges on them selected and authorized by an officer of arms.

The so-called royal standard of Great Britain is more properly a banner (q.v.), being a square flag with the national arms covering the entire field without any external accessories. The so-called cavalry standards in use in the British army are also in strictness banners. They are small in size; their color is determined by the color of the regimental facings, and they are charged with the cipher, number, insignia, and honors of the regiment. The banners of the household troops are, however, all crimson and richly embroidered with the royal insignia of England. Corresponding to the standards of the cavalry are the colors of the infantry regiments, of which each has "a pair," one, called the queen's color, being the union jack (q.v.), charged with some ornamental device; the other, the regimental color, with the cipher, number, device, motto, and honors of the corps, cantoned with a small union jack. When a regiment obtains new colors, they are usually given by the wife of the col. or some lady of distinction.

STANDARD, BATTLE OF THE, a battle between the English and Scots which took place on Cutton moor, near Northallerton, when the latter were defeated with great loss. On the usurpation of Stephen, David I. of Scotland, who, along with Stephen, had sworn to defend the rights of Matilda, daughter of Henry I., invaded England in pursuance of his oath, and compelled the barons of the northern part of the kingdom to swear fealty to that princess. After a war of nearly three years' duration, David encountered the English troops at Cutton moor, on Aug. 22, 1138, with a large but undisciplined army, who, partly in consequence of a rumor that the king was slain, were thrown into confusion, and the most disastrous rout followed, in which the Scots are said to have lost 10,000 men. The battle derived its name from the circumstance that a ship's mast, bearing on its summit the consecrated host, and surrounded by the banners of St. Peter of York, St. John of Beverly, and St. Wilfred of Ripon, elevated on a wagon, marked the center of the English army.

STANDARDS. In carpentry, the quarters or upright posts in wooden partitions are so called. The upright timbers to which doors are hung are called door-standards.

STANDING ORDERS is the name given to those permanent regulations which may be made by either house of parliament for the conduct of its proceedings, and are binding on the house by which they are made as continual by-laws enduring from parliament to parliament unless rescinded. A standing order of the house of lords, when rescinded, is said to be *vacated*; in the commons the corresponding term is *repealed*. In the lords, a motion for making or dispensing with a standing order cannot be granted on the same day that the motion is made, or till the house has been summoned to consider it; and every standing order, as soon as agreed to, is added to the "roll of standing orders," which is carefully preserved and published from time to time. In the house of commons there was, until 1854, no authorized collection of standing orders, except such as related to private bills. In that year a manual of rules, orders, and forms of proceeding relative to public business was drawn up and printed by order of the house.

Standing orders are occasionally suspended when it is desirable that a bill should be passed with unusual expedition.

STANDING STONES. Large rude unbewn blocks of stone, artificially raised to an erect position at some remote period, have been found in almost every part of the world where man has fixed his habitation. We find them in Britain, in continental Europe, in Assyria, India, Persia, and even in Mexico, and they are generally of such a size that their erection pre-supposes some degree of skill in the use of mechanical power. They are especially abundant in the British isles, where they sometimes stand singly, and sometimes in more or less regular groups; and it was long the general opinion of archaeologists that they were connected with the Druidical worship of the Celtic races. The result of modern investigation has been to throw doubts on the Druidical theory, while no other explanation has been given which is in all cases satisfactory. The erection of a large stone not easily shifted from its place is perhaps the earliest mode which man's instinct would contrive of preserving the memory of an event or of a hero; and there can be no doubt that many of these monoliths mark the site of a grave or of a battle-field. Human skeletons, and bronze, and iron weapons, have been in numerous cases found underneath them. A traditional remembrance of this origin is preserved in the name of "cat stane" (from Celtic *cath*, battle), given to some of them in Scotland, and "bauta stein" (battle stone) in Norway. Another possible purpose is preserved in the Scottish name of "hair stane," or boundary stone, by which they are occasionally known; not a few of them, whatever their original object, having been long used as landmarks, and being alluded to as such in very early charters. A third use of these monoliths is at least as old as the historical books of the Old Testament. We read in Judges ix. 6, of Abimelech being made king "by the pillar which was in Shechem,"

and in 2 Kings xi. 14, of Joash, when he was anointed king, standing "by a pillar as the manner was;" and a like usage prevailed in ancient Britain, where the king or chief was elected at the "Tanist stone" (from *Tunist*, the heir-apparent among the Celts), and there took a solemn oath to protect and lead his people. A very celebrated stone of this kind was the *lia fail* of Ireland, which was brought to Icolmkill for the coronation of Fergus Ere; and after being removed to Scone, became the coronation stone of Scotland, till conveyed away by Edward I. to Westminster, where it now forms part of the coronation chair of the sovereigns of the United Kingdom. In all these cases there is an idea of a solemn religious sanction attached to the stone; and a peculiar degree of sacredness seems to have invested any contract entered into at one of those perforated stones which are or were occasionally to be met with in England and Scotland. Such a stone, with an oval hole large enough to admit a man's head, till lately adjoined the monolithic group of Stennis in Orkney. It was known as the "stone of Odin," and continued till the middle of last century to be the scene of the interchange of matrimonial and other vows, he who broke the vow of Odin being accounted infamous. It is said to have been the popular belief that any one who had in childhood been passed through the opening would never die of palsy. The power of curing rheumatism was ascribed to a perforated stone at Madderty in Cornwall. While many of the monoliths in Britain are undoubtedly of a very remote age, there are some indications that the practice of erecting them continued for a time after the introduction of Christianity, and that they were used to subserve purposes connected with the new faith. A series of monoliths in the island of Mull are traditionally said to have been guide-posts to pilgrims visiting Iona, and it has been suggested that they point out the route which St. Columba must have pursued on his way to the residence of the Pictish king, Brude Mac Meilochon.

Still more puzzling to archæologists than the single monoliths are the large symmetrical groups of them, of which the most remarkable are Stennis in Orkney, Stonehenge and Avebury in Wiltshire, and Carnac in Brittany; all which, till lately, existed comparatively entire, though they have all been in the memory of the present generation more or less despoiled for building purposes. The most imposing of these monuments is Stonehenge (q.v.). At Stennis from 70 to 80 stones were grouped in two separate circles of 360 and 100 ft. diameter, respectively, the largest stones being in the smaller circle. At Avebury two double concentric circles were surrounded by an outer circle of 100 stones, the whole being approached by two long avenues of stones in double lines. In all these and other instances the circles were surrounded by a trench and mound. At Carnac the stones are placed not in circles but in straight lines, with a curved row at one end—an arrangement which has suggested the idea of a burial-place on the site of a great battle-field. All around Carnac, as well as Stonehenge, Barrows and Cromlechs (q.v.) are to be found. While the popular notion of all these monuments is that they were Druid temples, the circular form so frequent among them has also suggested that they may originally have been connected with sun-worship, and it is not impossible that they may have been used in turn for the successive religious worship of different races. They seem also to have served the purpose of courts of justice, or battle-rings for the duel and judicial combat. See **STONEHENGE**.

A remarkable description of monument, whose purpose is utterly unknown to us, is the *rocking-stone* (q.v.) or *logan-stone*. For a notice of a class of standing stones of considerable interest, ornamented with a peculiar description of sculpture, and found largely in Scotland, see **SCULPTURED STONES**.

STANDISH, MILES, 1584-1656; b. England; was a soldier in the Netherlands; was one of the emigrants who came to Plymouth in the *Mayflower* in 1620, though not a member of the Leyden church; showed great courage and energy, and was chosen military leader by the pilgrims in their wars against the Indians. His daring and skill awed the savages, and saved the settlements from their murderous assaults. During the first winter he lost his wife Rose. In 1625 he visited England as agent for the colony, returning in 1626 with supplies; was one of the proprietors and settlers of Duxbury, holding the office of magistrate or assistant for the town during the remainder of his life; took part in 1649 in the settlement of Bridgewater. His sword is in the Pilgrim hall, Plymouth. In Oct., 1872, the corner-stone of a monument to his memory was laid in Duxbury. The monument has been completed. It stands on Captain's Hill, a bold promontory on which Standish lived. It is a handsome circular stone tower 110 ft. high, surmounted by a statue of Standish. The view there is one of the finest on the coast. Longfellow has related the story of Standish in the poem, *The Courtship of Miles Standish*.

STANFIELD, WILLIAM CLARKSON, a distinguished painter, was b. of Irish parents, in the town of Sunderland, about 1793. At an early period of his life he went to sea, and made frequent long voyages, among which was that to China. In the China seas he passed some years of his life, and served for a time in the same ship with Douglas Jerrold—Stanfield in the capacity of a common sailor, and Jerrold as a midshipman. While thus engaged, Stanfield exhibited considerable talent both in painting and drawing. The first person of public note, however, to observe Stanfield's genius as a painter was the celebrated Capt. Marryat, who met with him in the Mediterranean, serving in a king's ship as captain's clerk. Stanfield and Marryat afterward became intimate; and

in 1840 the novelist employed the painter, then become famous, to illustrate his *Poor Jack*. Stanfield left the navy, in consequence of an injury to his feet, through a fall from the fore-topgallant mast-head of his ship. He then took to scene-painting as a means of earning his bread. His first efforts in this direction were made in the old Royalty theater, Wells street, Wellclose square, in the e. end of London, about the year 1818. He was afterward employed at Drury Lane theater, and here it is said that he produced some of his most extraordinary effects. He carried on this occupation until the year 1837, when he finally abandoned it, except on rare occasions. Stanfield, while painting for the theaters, had by no means neglected easel-painting. The first picture by him that attracted any considerable notice was "Market-boats on the Scheldt," exhibited at the British institution in 1826. The picturesque grouping, variety of figures, and gay costumes were much admired. His "Wreckers off Fort Rouge, Calais," exhibited in the following year, also at the British institution, was even more successful. In 1838 he obtained from the British institution a prize of fifty guineas for another of his pictures. In 1830 Stanfield made his first excursion on the continent, and in the same year exhibited at the academy his "Mount St. Michael, Cornwall," which placed him at once in the foremost rank as a marine painter. In 1833 Stanfield, in conjunction with David Roberts and others, founded the society of British artists. His election to the academy as associate took place in 1832; and in 1835 he was chosen R.A., in conjunction with sir William Allan. In 1833 Stanfield exhibited at the academy the first of a series of pictures of Italian scenery, painted for the marquis of Lansdowne for the banqueting-room at Bowater. In 1834 he commenced a similar series for the duke of Sutherland. In 1836 he exhibited "The Battle of Trafalgar," painted for the Senior United Service club; and in 1841 his celebrated "Castello d'Ischia," engraved by the art-union in 1844. In 1843 he sent to the academy "Mazerbo and Lucello, Gulf of Venice," said to be one of the finest landscapes he ever painted. "A Skirmish off Heligoland" (1867), was Stanfield's last contribution to the exhibitions of the academy, of which he was so distinguished a member. His great merit lies in the skillful combination of land and sea in the same view. Stanfield died on May 18, 1867.

STANFORD, LELAND, b. Watervliet, N. Y., 1824; descended from pioneers of 1720 who settled in the Mohawk Valley; educated at the public schools; studied law; was admitted to the bar in 1849, and practised law in Port Washington, Wis., until 1852, when he went into business with his brothers in Sacramento, Cal. He was a delegate to the republican convention at Chicago which nominated Abraham Lincoln for the presidency in 1860; governor of California, 1862-64; one of the projectors of the Pacific railroad, and president of the Central Pacific railroad company, and is prominent in railroad and financial matters on the Pacific coast; elected to U. S. senate, 1885. He founded the Leland Stanford Junior University at Palo Alto, California, in memory of his only son, opened in 1891. Senator Stanford died in 1893.

STANHOPE, CHARLES MAHON, third Earl of, 1753-1816; b. London; educated at Eton school and at Geneva; in 1774 married lady Hester Pitt, daughter of the earl of Chatham. In politics he was an advanced liberal, advocated republican ideas, and was known in the house of lords as the "minority of one." He is best known, however, for his mechanical inventions and improvements, the most important of which was the Stanhope printing-press. He also made some discoveries in regard to electricity, and introduced a new system of canal locks. Among his voluminous writings were: *Observations on Mr. Pitt's Plan for Reducing the National Debt*, *Rights of Juries Defended*, *Principles of Electricity*, etc.

STANHOPE, Lady HESTER LUCY, the eldest daughter of Charles, third earl Stanhope, and his wife Hester, daughter of the great lord Chatham, was b. Mar. 12, 1776. She grew up to be a woman of great personal charm, and of unusual force and originality of character. Very early she went to reside with her uncle, William Pitt, and as mistress of his establishment, and his most trusted confidant during his season of power, and till his death, she had full scope for the exercise of her imperious and queenly instincts. On the death of Pitt, a pension of £1200 a year was assigned her by the king. Mr. Fox proposed to provide for her much more munificently, but she proudly declined his offers, as unwilling to accept benefit at the hands of the political enemy of her dead uncle. The change from the excitements of a public career, as it might almost be called, to the life of an ordinary woman of her rank with means somewhat insufficient, was naturally irksome to her, and in 1808 she was tried still further by the death, at Coruna, of her favorite brother, Major Stanhope, and of sir John Moore, for whom she is known to have cherished an affection. The precise relations between them have never been made known; but the last words spoken by the dying hero were: "Stanhope" (a captain Stanhope of his staff, who stood by him) "remember me to your sister." Conceiving a disgust for society, she retired for a time into Wales, and in 1810 she left England never to return to it. In mere restlessness of spirit she wandered for a year or two on the shores of the Mediterranean, and finally settled herself among the semi-savage tribes of mount Lebanon. Here she led the strangest life, adopting in everything the eastern manners, and by the force and fearlessness of her character, obtaining a curious ascendancy over the rude races around her. She was regarded by them with superstitious reverence as a sort of prophetess, and gradually came so to consider herself. With the garb of a Mohammedan chieftain, she adopted something of the faith of one, and her

religion, which seems to have been sincere and profound, was compounded in about equal proportions out of the Koran and the Bible. Her recklessly profuse liberalities involved her in constant straits for money; and her health also giving way, her last years were passed in wretchedness of various kinds, under which, however, her untamable spirit supported her bravely to the end. She died in June, 1839, with no Frank or European near her, and was buried in her own garden. The main sources of information about her are the notes of the frequent travelers who visited her in her strange seclusion, and the *Memoirs* derived from her own lips, and afterward (3 vols. Lond. 1845-46) published by a medical gentleman who went abroad with her, and from time to time lived with her in her retirement.

STANHOPE, PHILIP HENRY, Earl, historian and biographer, was representative of a branch of the family of the Stanhopes, earls of Chesterfield. Its founder, a distinguished diplomatist in the reigns of William III. and Queen Anne, was son of the first earl of Chesterfield. James, first earl Stanhope, was an eminent military commander, who effected the reduction of Port Mahon, in the island of Minorca, and was the favorite minister of George I. His grandson, the third earl, distinguished for his scientific researches, and inventor of a printing-press which bears his name, died 1816. The subject of this notice, only son of the fourth earl, was born at Walmer, 1805. His courtesy title was viscount Mahon. He received a private education, but graduated at Oxford, where he took his B.A. degree, 1827; created D.C.L. 1834. He entered the house of commons in 1830. He was greatly instrumental in 1842 in securing the passing of the copyright (q.v.) act; was under-secretary for foreign affairs during the brief Peel administration, 1834-35; and secretary to the Indian board of control under the same minister, 1845-46. He was a moderate conservative in politics, and was warmly attached to sir R. Peel, who named him one of his literary executors. His contributions to history are numerous and valuable. Macaulay, in a review of one of his earliest works, the *War of the Succession in Spain*, accredits him with some of the most valuable qualities of a historian, viz., perspicuousness, conciseness, "great diligence in examining authorities, great judgment in weighing testimony, and great impartiality in estimating characters." His most considerable work is *A History of England from the Peace of Utrecht to the Peace of Versailles*, 1713-83, in 7 vols. His other works include a *Life of the Right Hon. W. Pitt*; a *History of Spain under Charles II.*; a *Life of the Great Condé*; a *Life of Belisarius*; a volume of *Historical and Critical Essays*; and a volume of *Miscellanies*. Of the *Life of Condé* it may be remarked that it was originally written by the author in the French language, and that the English work is really a translation, executed under his superintendence. In conjunction with the right hon. E. Cardwell he edited the *Memoirs of Sir R. Peel*; and he also published an edition of *Lord Chesterfield's Letters*. He was elected president of the society of Antiquaries, 1846; lord rector of the university of Aberdeen, 1858. He was mainly instrumental in procuring the appointment of the historical manuscripts commission. He was elected one of the six foreign members of the academy of moral and political sciences at Paris in 1872. His death took place at Bournemouth, Dec. 24, 1875.

STANISLAS, AUGUSTUS, King of Poland. See **POLAND**.

STANISLAS LESZCZYŃSKI, 1677-1766; b. Poland; elected to the Polish throne in 1704, and driven from it by the defeat of Charles XII. of Sweden, at Poltava, in 1709. He was a prisoner in Turkey, 1713-14. His daughter Maria married Louis XV. in 1725, and the latter, on the death of Augustus II. in 1733, began a war to place his father-in-law, who had been re-elected, on the throne. In 1735 Stanislas gave up his claims to the throne, but retained the royal name and estates, and was given the duchies of Bar and Lorraine, and a pension of 2,000,000 francs. He was a patron of literature and art.

STANISLAUS, a co. in central California; bounded on the n. by the Stanislaus river; drained by the Tuolumne and the San Joaquin rivers; on the Southern Pacific railroad; 1486 sq. m.; population '90, 10,040, chiefly of American birth. The surface is generally level, except in the w. where it is intersected by the Coast range. The soil is fertile. The principal productions are wheat, wool, and barley. Gold is found. Co. seat, Modesto.

STANISLA'WOW, or **STANISLAU**, a town and railway junction of Galicia, Austria, pleasantly situated between two branches of the Bistrica, 75 m. s.e. of Lemberg. It is the seat of active trade and manufactures. Pop. '90, 22,391.

STANLEY, a co. in S. Dakota, having the Missouri river for its e. boundary, and the n. fork of the Big Cheyenne for its n.; also drained by the Bad river; 1155 sq. m.; pop. 1890, 1028, chiefly of American birth. The surface consists of fertile rolling prairies. It has old fort George in the extreme s.e., and fort Bennett in the extreme n.e. Co. seat, Fort Pierre.

STANLEY, The Very Rev. ARTHUR PENRHYN, D.D., an eminent scholar and divine of the church of England, was the son of the late Edward Stanley, D.D., bishop of Norwich, and nephew of the late lord Stanley of Alderley. He was born Dec. 13, 1815, while his father was rector of Alderley, and resided there. Educated at Rugby under

the care of Dr. Arnold, he passed (1834) as an exhibitioner to Balliol college, Oxford, where he achieved a brilliant reputation, winning the Ireland scholarship, and taking a first class in classics (1837), the Latin essay prize (1839), and the English essay and theological prizes (1840). In 1838 he was chosen a fellow of University college, of which he was tutor and examiner for many years. Appointed canon of Canterbury (1851), professor of ecclesiastical history at Oxford (1856), canon of Christ church, and chaplain to the bishop of London (1858), he succeeded archbishop Trench in 1863 as dean of Westminster. He was also chaplain to the prince of Wales, and chaplain-in-ordinary to the queen. In 1863 he married lady Augusta Bruce, daughter of the 7th lord Elgin (died 1876). He was elected lord rector of St. Andrew's university in 1874. He visited the United States in 1878, and delivered several sermons and addresses. He died in London, July 18, 1881. Stanley was one of the most accomplished and liberal theologians of this age, and may be fairly regarded as the leader of the "broad church" party. In virtue of his literary genius, solid acquirements, and sympathetic and generous piety, he ranked among the most eminent of recent Christian teachers. His principal writings, besides his contributions to Smith's classical dictionaries, are the life of Dr. Arnold (1844); *Sermons and Essays on the Apostolical Age* (1847); *Memoir of Bishop Stanley* (1850); *The Epistles to the Corinthians* (1854); *Sinai and Palestine* (1855); *The Unity of Evangelical and Apostolical Teaching* (1859); *Lectures on the Eastern Church* (1861); *Lectures on the Jewish Church* (1863-65, 1876, 1879); *Sermons preached before the University of Oxford* (1860-63); *Historical Memorials of Westminster Abbey* (1867); *The Three Irish Churches* (2d. ed., 1869); *Essays on Church and State* (1870); *The Athanasian Creed* (1871); *Lectures on the History of the Church of Scotland* (1872); *Memoirs of Edward and Catherine Stanley* (1880); *Christian Institutions* (1881). His last literary work was done as a member of the assoc. for the revision of the Bible. He had a great love for Westminster Abbey, and did much to improve and popularize it; familiar with its every detail he delighted to act the cicerone for all classes of visitors. His great personal popularity was attested at his funeral, when all ranks of society, men of differing creeds and of no creed, gathered together to do reverence to the memory, not only of a great public man, but also of one whom they esteemed as a personal friend.

STANLEY, DAVID SLOANE, b. Ohio, 1828; graduate of West Point, 1852; distinguished himself in the war with the Comanche Indians, following them to their defeat in the Wichita mountains, 1859. At the beginning of the civil war he held the rank of capt. 4th cavalry, rising to maj. gen. of volunteers, 1862. After gallant service at Wilson's creek he was disabled by a fall from his horse, and on his recovery commanded the 2d division of the army of the Mississippi under Gen. Pope, performing effective service at Iuka and Corinth; chief of cavalry, army of the Cumberland, 1862; went with the expedition to Huntsville, Ala., crossed the Tennessee, and marched to the sea with Sherman. He was disabled on the field of Franklin, Tenn., where his presence saved the day. He was appointed col. 22d infantry U. S. A., 1866; brig.-gen., 1884; commander of the district of New Mexico and of department Texas, until his retirement, June 1, 1892.

STANLEY, The Right Hon. EDWARD HENRY SMITH, earl of Derby, an eminent English statesman, eldest son of the fourteenth earl of Derby (q.v.), was born at the family-seat, Knowsley Park, Lancashire, July 21, 1826; was educated at Rugby, and at Trinity college, Cambridge, where he concluded a distinguished university career by taking a first class in classics in 1848, together with a declamation prize and mathematical honors. He early adopted the profession of statesmanship, and especially applied himself to the study of social and economical questions. During his absence on a tour in Canada, the United States, and the West Indies, he was elected (Dec., 1848) M.P. for King's Lynn on the death of lord G. Bentinck. He afterward visited the east, and was still in India when his father received the queen's commands to form an administration in which Stanley was appointed under-secretary for foreign affairs. In 1855, on the death of sir W. Molesworth, lord Palmerston paid him the compliment of offering him the seals of the colonial office. The offer was declined; but in 1858 he was appointed to the secretaryship of the colonies in lord Derby's administration, and was soon called upon to succeed the earl of Ellenborough (q.v.) as president of the board of control for the affairs of India. The great Indian mutiny had not yet been quelled, and it devolved upon Stanley to frame resolutions and bring in a bill abolishing the East India company (q.v.), and transferring their Indian possessions to the direct government of the crown. This duty he performed with consummate ability. The great mutiny was put down during his secretaryship, and in Feb. 1859 he had to meet the legacy of financial disorganization which it bequeathed. The Derby government resigned before Stanley could carry out his plans for establishing the finances of India on a sounder basis; but he gave effective support to his successor in office, in reducing the military expenditure, and other measures of administrative improvement. In his father's third administration, formed in July, 1866, he was invested with the office of secretary of state for foreign affairs, and the ability and tact he displayed in conducting the negotiations for the settlement of the Luxemburg difficulty obtained for him a considerable amount of popularity. He continued in this office till the accession of the Gladstone ministry to power in 1868. In April, 1869, he was installed lord-rector of the university of Glasgow, and in October of the same year, on the death of his father, he took his seat in the house of lords. He was again made foreign secretary by Mr. Disraeli in 1874; but on account of

divergence from the views of the premier on the eastern question, he, like his colleague, the earl of Carnarvon, retired from the ministry early in 1878. He was distinguished by his support of workingmen's institutes, and of the cause of popular education. He was colonial secretary from 1882 to 1885. He joined the liberal unionists in 1886. He died in 1893.

STANLEY, HENRY MORTON, explorer; b. near Denbigh, Wales, 1841, was brought up and educated in a poorhouse; at the age of 14 shipped as a cabin-boy on a sailing vessel bound to New Orleans, and there was adopted by a merchant named Stanley, and took his name, his own being John Rowlands. He served in the confederate army; was taken prisoner, and then volunteered in the federal navy, becoming ensign in the ironclad *Ticonderoga*. After the war he became a newspaper correspondent, and as special writer for the *New York Herald* accompanied the English expeditions to Abyssinia and Ashantee in 1868. In 1869 he was commissioned by the proprietor of that paper to visit the interior of Africa and find the long-lost missionary and explorer Livingstone, and starting from Zanzibar in April, 1871, he met Livingstone at Ujiji on Nov. 10.

Under a joint commission from the *New York Herald* and the London *Daily Telegraph* Stanley started from the e. coast of Africa in 1874, circumnavigated the Victoria Nyanza, marched across country to the Albert Nyanza, and then coming s. again examined part of Tanganyika and its outlet toward the Lualaba. From Unyanyembe he pushed onward along the course of the Lualaba, supported by a large party of followers, and frequently having to repel violence by force of arms; and arriving at the mouth of the Congo in Aug., 1877, he proved that those surmises were correct which identified the Congo with the great and many-named river issuing from the lake country s.w. of Tanganyika.

He returned to England in 1877, but was soon placed in charge of the African International Association (q.v.), and labored in the Congo Free State till 1886. In 1887 he again sailed from England for Africa to rescue Emin Pasha, gov. of the Province of equatorial Africa, who by the revolt in the Soudan had been cut off from the rest of Egypt. Starting with a caravan from Matadi on the lower Congo, Mar. 21, he succeeded after great risk and hardship in reaching Emin Pasha, and when the latter was forced to retire from his post, guided him and his followers to the east coast, which was reached Dec. 3, 1889. During this expedition Stanley discovered that the Albert Edward and Albert Nyanza lakes were connected by the Semliki river, and that an arm of the Victoria Nyanza extends to within 155 miles of lake Tanganyika. Returning to England, he was given the degree of D.C.L. by Oxford university, was presented with the freedom of several cities, and on June 18 was appointed governor of the Congo Free State by the king of Belgium. On July 12 he was married in Westminster Abbey to Miss Dorothy Tennant, a Welsh lady and an artist of note. Stanley has pub. *How I Found Livingstone* (1872); *My Kalulu* (1872); *Coomassie and Magdala* (1874); *Through the Dark Continent* (1878); *The Congo* (1885); *In Darkest Africa* (1890); *My Dark Companions* (1893); *Slavery and the Slave Trade in Africa* (1893); *My Early Travels and Adventures in America and Asia* (1895). Since 1890 he has resided in England, and in July, 1895, was elected to Parliament from Lambeth.

STANLEY, THOMAS, 1625-78; b. England. He graduated from Cambridge in 1641, traveled in Europe, and studied law. He published *Poems and Translations*, and a *History of Philosophy*. In 1663 appeared his edition of *The Tragedies of Æschylus*, with Latin translation and a commentary. An edition of his poems was published in 1814 with a biographical memoir by Sir Egerton Brydges.

STANLY, a co. in central North Carolina, bounded on the e. and n.e. by the Yadkin river. Area, 390 sq.m.; pop. '90, 12,136. Co. seat, Albemarle.

STANNARIES (Lat. *stannum*, tin), the mines from which tin is dug. The term is most generally used with reference to the peculiar laws and usages of the tin mines in the counties of Cornwall and Devon. By an early usage peculiar to these counties, the prerogative of the crown, elsewhere reaching only to gold and silver mines, is extended to mines of tin, which are the property of the sovereign, whoever be the owner of the soil. A charter of King John to his tinners in Cornwall and Devonshire, of date 1201, authorized them to dig tin, and turf to melt the tin, anywhere in the moors, and in the fees of bishops, abbots, and earls, as they had been used and accustomed—a privilege afterward confirmed by successive monarchs. When Edward III. created his son, the Black Prince, duke of Cornwall, he at the same time conferred on him the stannaries of Devon and Cornwall, which were incorporated in perpetuity with the duchy. Their administration is committed to an officer called the lord warden of the stanneries, who has two substitutes or vice-wardens, one for Cornwall and one for Devon. In former times representative assemblies of the tinners (called parliaments) were summoned by the warden under a writ from the duke of Cornwall, for the regulation of the stannaries and redress of grievances; the last of them was held in 1752. The stannary courts are courts of record held by the warden and vice-warden, of the same limited and exclusive character as the courts-palatine, in which the tinners have the privilege of suing and being sued.

STANNIC ACID. See **TIN**.

STANOVOI, or **STANOWOI KHREBET** (Framework mountains), an extensive mountain chain in Siberia, in the extreme n.e. of Asia, forms the watershed between the rivers which flow n. into the Arctic ocean, and those which are tributary to the Amoor. The chain extends in an e.n.e. direction from the Transbaikal territory along the shores of the sea of Okhotsk, separating into several branches, one of which stretches e. to Behring's strait. Of this great mountain chain, the length of which is estimated at 2700 m., little is known further than that it is elevated and rugged, and that its peaks are covered with perpetual snow. The highest peak is Mt. Sokhondo, about 9250 feet.

STANSTEAD, a co. in s.e. Quebec, having lake Memphremagog for its w. boundary; drained by lake Massawippi in the n.; 408 sq. m.; pop. '91, 18,067. It is bounded on the s. by the state line of Vermont, and is intersected by the Central Vermont, the Boston and Maine, and the Grand Trunk railways. Co. seat, Stanstead.

STANTON, a co. in s.w. Kansas, having the state line of Colorado for its w. boundary; 672 sq. m.; pop. '90, 1031, chiefly of American birth. It is drained by branches of the Arkansas river. The surface is rolling, and adapted to grain culture and grazing. Co. seat, Johnson.

STANTON, a co. in n.e. Nebraska, drained by the n. branch of the Elkhorn river, Maple and Taylor creeks; 432 sq.m.; pop. '90, 4619, chiefly of American birth. The surface is undulating, thinly timbered, and adapted to grain culture and grazing. It is intersected by the Sioux City and Pacific railroad. Co. seat, Stanton.

STANTON, EDWIN McMASTERS, 1814-69; b. Ohio; of Quaker stock, originally from Culpeper co., Va.; graduated from Kenyon college in 1833. He entered a book-seller's store in Columbus, Ohio, where he remained but a brief time; studied law, and was admitted to the Columbus bar in 1836. He first practiced in Cadiz, Ohio, and became prosecuting attorney of the county; afterward practiced in Steubenville, Ohio; and in 1839-42, reported the decisions of the supreme court of the state. In 1848 he settled in Pittsburg, Penn., where he became the leader of the bar, and gained a high reputation for his masterly arguments in the case of the state of Pennsylvania vs. the Wheeling Bridge company. In 1856 he removed to Washington and practiced extensively before the U.S. supreme court. In 1858 he was in California acting as counsel of the United States in certain important land cases. After Mr. Lincoln's election in 1860, on the resignation of Mr. Cass from the cabinet, and the appointment of Mr. Black, then attorney-general, to succeed him, Mr. Stanton was appointed attorney-general. At the close of Mr. Buchanan's administration in the following March he retired with the other outgoing members of the cabinet; but in Jan., 1862, was recalled by Mr. Lincoln, and took the portfolio of secretary of war, in which office he sustained the burden of the vast war operations of the government to a degree that was not equaled by any other man. His administration was marked by a course of integrity, comprehensive judgment, determination, and force which won for him the admiration of his countrymen. He was in advance of the president in humanitarian leanings with regard to the negro, the severity of his nature being curiously softened in this connection. Mr. Lincoln viewed the integrity of the entire political system in his conduct of affairs, rather than any one element thereof, and it was not until after long effort on the part of Mr. Stanton that he was induced to specially entertain the negro question on its own merits, and to take that definite course which resulted in the emancipation act. Mr. Stanton continued a member of the cabinet under president Johnson's administration until May 26, 1868. His resignation occurred after a serious and painful imbroglio, which resulted in the impeachment of Mr. Johnson, which impeachment was not sustained on trial. Congress passed a vote of thanks to Mr. Stanton on his retirement. He resumed the practice of his profession, but his health was broken by his long and arduous labors, and he was speedily forced to retire from active employment. On Dec. 20, 1869, President Grant nominated him an associate justice of the supreme court, and he was at once confirmed by the senate. He died four days after this appointment.

STANTON, ELIZABETH (Cady), b. N. Y., 1815; married Henry B. Stanton in 1840. She attended the world's anti-slavery convention at London, where she met Lucretia Mott, with whom she signed the call for the first woman suffrage convention in 1848. This convention, which met at her house in Seneca Falls, N. Y., made the first formal demand for woman suffrage. She has addressed several constitutional conventions and congressional committees in England, Scotland, and the United States, and canvassed Kansas in 1867, and Michigan in 1874, in behalf of her cause. She was president of the first International Council of Women, held in Washington, 1888.

STANTON, HENRY BREWSTER, b. Conn., 1805; studied theology at Lane seminary; was delegate to the world's anti-slavery convention, London, 1840, and its secretary; admitted to the bar in Boston, 1842; removed to Seneca Falls, N. Y., 1848; was state senator, 1849 and 1851. He published *Reforms and Reformers of Great Britain and Ireland*, and for many years contributed to the *New York Tribune* and *New York Sun*. He was a popular anti-slavery lecturer. He d. 1887.

STANWIX, JOHN, 1690-1765; b. England; entered the army, 1706; became capt. of grenadiers, 1739; maj. of marines, 1741; lieut.col., 1745; equerry to Frederick, prince of Wales, 1749; made governor of Carlisle, and represented it in parliament, 1750; deputy

quartermaster gen. of the forces, 1754; sent to America as commander of the 60th, or royal Americans, and put in charge of the southern district with headquarters at Carlisle, Penn., 1757; made brig. gen.; was sent to Albany, 1758, and ordered to erect a fort at the Oneida carrying place, which in his honor was called fort Stanwix; returned to Pennsylvania, 1759; became maj. gen.; returned to England, and became member of parliament.

STANZA. See RHYME.

STAPELIA. See CARRION FLOWERS.

STAPHYLE A and **STAPHYLEA/CEÆ.** See BLADDER-NUT.

STAPHYLOMA (from the corresponding Greek word, derived from *staphylē*, a bunch of grapes, or, in this case, rather a grape at the end of a stalk) is a term employed by the oculist to signify any protrusion on the anterior surface of the eye. Staphyloma of the iris occurs when there is a protrusion of the iris through a perforation of the cornea, consequent either on ulceration or on a wound. Staphyloma of the cornea occurs when that coat of the eye is more or less completely destroyed, and when the cicatrix with which the iris has become covered is caused to protrude, by the pressure of the fluids of the eye, in the form of an opaque white prominence. It is unnecessary to enter into details of the treatment of these affections, which must be left entirely to the hands of the surgeon.

STAPLE (Ang.-Sax. *stapel*, a prop, support; a heap, and hence a place where goods are stored up or exposed for sale), a term applied, in the commerce of the middle ages, in the first instance, to the towns in which the chief products of a country were sold, and afterward to the merchandise that was sold at the staple towns. The staple towns, at first chosen from convenience, came in the course of time to be invested with important privileges. The staple merchandise of England has been enumerated as wool, wool-fells (i.e., sheep-skins), leather, lead, and tin, to which have sometimes been added butter, cheese, and cloth. Wool was, however, in point of fact, a far more important article of export than any of the rest, and was really the subject of those multitudinous regulations which fixed the staple in particular towns, both of England and of the continent. Goods intended for exportation had, in the first instance, to be exposed for sale at the staple town; the principal purpose of this regulation being, probably, to restrict commerce to those places where the officers who collected the king's customs could superintend it. Another object kept in view in the provisions made in the 13th and 14th centuries with respect to the staple was the encouragement of the resort of foreign merchants; indeed, greater privileges seem to have been accorded to the foreign than to the English merchants who attended the staple.

A tribunal of great antiquity, called the court of the staple, had cognizance of all questions which should arise between merchants, native or foreign. It was composed of an officer, called the mayor of the staple, re-elected yearly by the native and foreign merchants who attended the staple; two constables, appointed for life, also chosen by the merchants; a German and an Italian merchant; and six mediators between buyers and sellers, of whom two were English, two German, and two Lombard. The law administered was the *lex mercatoria*, and there was a provision that causes in which one party was a foreigner should be tried by a jury one-half of whom were foreigners. The most important legislative enactments regarding the staple and the court of staple were the statute of action Burnel (11 Edward I.), by which merchants were enabled to sell the chattels of their debtor, and attach his person for debt; 13 Edw. I. c. 3; and 27 Ed. III. c. 2, called the statute of staple, one object of which was to remove the staple formerly held at Calais to certain towns in England, Wales, and Ireland. With the growth of commerce the staples became more and more neglected, and at last fell altogether into disuse.

STAPLES, WILLIAM READ, 1798-1868, American historian and jurist, graduated at Brown university in 1817, became an associate judge of the Rhode Island supreme court in 1835, was chief justice of that court 1854-6, and from the latter year to the time of his death held the offices of secretary and treasurer in the Rhode Island society for the encouragement of domestic industry. He published the *Annals of Providence to 1834* (1843) and a *Documentary History of the Destruction of the Gaspe* (1845), besides editing several historical works.

STAPLETON. See STATEN ISLAND.

STAPLETON, SIR ROBERT, d. 1669, English author. He was brought up as a Roman Catholic and studied at Douai, but became a Protestant convert and gentleman usher to Charles II. He wrote translations of Juvenal and Musaeus and of French and Italian works. He was also the author of two plays, *The Slighted Maid* and *Hero and Leander*.

STAR, in heraldry. The star is of frequent occurrence as a heraldic bearing; it sometimes represents the heavenly body so called, and sometimes the rowel of a spur. In the latter case, it is blazoned a *mullet* (q.v.). Stars of more than five points should have the number of points designated, and the points may be wavy. A star, or *estoile*, with wavy points, is often designated a blazing star; and when the points are more than six in number, it is usual to represent only every second point as waved.

The star is a well-known ensign of knightly rank. A star of some specified form constitutes part of the insignia of every order of knighthood.

STAR, ORDER OF THE, an order of knighthood formerly existing in France, founded by John II. in 1350, in imitation of the then recently instituted order of the Garter in England. The ceremony of installation was originally performed on the festival of the Epiphany, and the name of the order is supposed to have been allusive to the star of the Magi.

STARAI'A-RUS'SA, a t. of Russia, in the government of Novgorod, 184 m. s.s.e. of St. Petersburg. The town is remarkable for its salt springs, which attract many visitors in summer. The means of communication between St. Petersburg and Starai'a-Russa, by the Moscow railway and the river Volkhov, are easy and rapid. Resident pop. '93, 15,673.

STAR ANISE. See **ANISE.**

STAR APPLE, *Chrysophyllum*, a genus of trees and shrubs of the natural order *sapotaceæ*. The species are natives of tropical and subtropical countries. The star apple of the West Indies (*C. cainito*) is a shrub of about 8 or 10 ft. high. The fruit is large, rose-colored, mixed with green and yellow; and has a soft sweet pulp of an agreeable flavor. Other species produce edible fruit.

STARBOARD. See **LARBOARD.**

STARCH, or **AMYLACEOUS MATTER,** $C_6H_{10}O_5$, is an organized substance of the class known as carbo-hydrates, which occurs in roundish or oval grains in the cellular tissue of certain parts of plants. It is very widely diffused through the vegetable kingdom, and is especially abundant in the seeds of the cereals, in the seeds of leguminous plants such as peas and beans, in the tuber of the potato, in the roots of arrowroot and tapioca, in the pith of the sago palm, etc. The grains of starch from the same kind of plant are tolerably uniform in size and shape, but vary in different species of plants from $\frac{1}{800}$ to less than $\frac{1}{8000}$ of an inch in diameter; and while some are circular or oval, others are angular; moreover, amongst other differences, some (chiefly the larger grains) exhibit a series of concentric rings, while in others no rings are apparent; and while the grains of potato starch, if illuminated by polarized light, with a Nicol's prism placed between the object and the eye, present a well-marked black cross; in wheat-starch no such cross is perceptible.

Ordinary commercial starch occurs either as a white glistening powder, or in masses which are readily pulverized; and when pressed between the fingers it evolves a slight but peculiar sound. It is heavier than water, and is insoluble in cold water, alcohol, and ether. If, however, it be placed in water at a temperature of 150° F. (65° C.), its granules swell from the absorption of fluid, and the mixture assumes a viscid, pasty consistence. Dilute acids rapidly induce a similar change, even without the agency of heat; and if heated with dilute sulphuric acid, the starch is first converted into dextrine, and finally into glucose or grape-sugar; and manufacturing chemists avail themselves of this property to obtain glucose on a large scale from starch. Starch dissolves in cold nitric acid, and on the addition of water to this solution, a white, tasteless, insoluble precipitate falls, which is known as *xylidine*, and explodes violently when struck by a hammer, or when heated up to about 350° F. (176° C.). The composition of this substance is not positively known, but in all probability one or two equivalents of the hydrogen of the starch (most probably two) are replaced by a corresponding number of equivalents of peroxide of nitrogen, NO_2 .

The reactions of starch with iodine and bromine are very remarkable. Iodine communicates to it a very beautiful purple color, and hence starch-paste serves as a delicate test for free iodine. The purple color which the iodine gives to the starch granules appears not to depend on a chemical combination, because on the application of heat the color disappears, and reappears on cooling. Bromine communicates a brilliant orange tint to starch—a reaction by which the presence of free bromine may be readily detected. When heated to a temperature of from 340° to 400° F. (171° to 204° C.), dry starch is converted into dextrine (q.v.), or British gum. At a higher temperature, it undergoes decomposition, and yields on dry distillation the same products as sugar. When heated in steam under pressure, it also passes into dextrine, and finally into glucose. The addition of a little sulphuric acid hastens these changes.

During the germination of seed, the starch undergoes a kind of fermentation, and is converted into a mixture of dextrine and glucose. This change is due to the action of a peculiar ferment termed diastase (q.v.), which exists in all germinating seeds during the process of growth, and is probably a mixture of albumen and gluten in a special stage of decomposition. Various animal matters, as, for example, saliva, pancreatic juice, the serum of the blood, bile, etc., exert the same action on starch as diastase. On prolonged exposure to the air, starch paste becomes acid, in consequence of the formation of lactic acid.

Starch is usually obtained by a simple mechanical separation of it from the other ingredients with which it is associated; advantage being taken of its insolubility in cold water. The details of the mode of separation vary according to the source from which it is procured. We extract from Miller's *Organic Chemistry* the method of procuring *potato-starch*: "This variety is prepared on a large scale from potatoes, which contain about 20 per cent. of amylaceous matter. The cellular tissue of the tuber does not exceed 2 per cent. of the mass; whilst of the remainder about 76 per cent. consists of

water, and the rest of small quantities of sugar, salts, and azotised matters. In order to extract the starch, the tubers are first freed from adhering earth by a thorough washing, and are then rasped by machinery. The pulp thus obtained is received upon a sieve, and is washed continuously by a gentle stream of water so long as the washings run through milky. This milkiness is due to the granules of starch which are held in suspension. This milky liquid is received into vats, in which the amylaceous matter is allowed to subside; the supernatant water is drawn off, and the deposit is repeatedly washed with fresh water until the washings are no longer colored. The starch is then suspended in a small portion of water, run through a fine sieve to keep back any portions of sand, and, after having been again allowed to settle, is drained in baskets lined with ticking. The mass is then placed upon a porous floor of half-baked tiles, and dried in a current of air, which is at first of the natural temperature; the drying is completed by the application of a moderate artificial heat" (pp.100,101). To obtain starch from wheat or rice, a more complicated process is required, as the large quantity of gluten which is associated with the starch in these grains requires to be removed either by fermentation, or, according to Jones's patent, by a weak alkaline solution, which dissolves the gluten, but does not effect the starch granules.

Commercially, there are two classes of starch—those used for food, and those used for manufacturing purposes. The former are treated under arrowroot (q.v.); the latter are chiefly made from wheat, rice, and potatoes; but in addition, large quantities of sago-starch are prepared in India, and sent to Europe, and small quantities are from time to time prepared from other sources, such as the fruit of the horse-chestnut, etc.

The importance of starch becomes at once obvious when we consider that it may be regarded as the starting-point in the preparation of brandy and other forms of spirit, and of beer and porter, and that it enters largely into the great *saccharine* group, constituting one of the leading subdivisions of food. See DIGESTION. It is, moreover, largely employed as an article of domestic use for laundry purposes, and also in the manufacture of dextrine and grape-sugar.

We shall conclude with a few words on starch in its physiological and medical relations. It might have been inferred *a priori* that starch was an essential article of diet, from the fact of its abundant occurrence in edible vegetables, even if the fact had not been established by numerous physiological experiments. Thus various kinds of potatoes yield from 12 to 27 per cent. of starch; peas, 32½ per cent.; beans, 34 to 36 per cent.; wheaten bread, 53½ per cent.; wheaten flour, 56½ to 72 per cent.; oatmeal, 59 per cent.; rye-meal, 61 per cent.; barley-meal, 67 per cent.; maize, 81 per cent.; rice, 83 to 85 per cent.; and it occurs in even larger proportions in arrowroot, sago, and tapioca. In a state of health, the proper diet consists in the due admixture of the albuminous, saccharine (or starchy), oleaginous, and saline groups; but in certain forms of disease, an excess or a diminution of the starchy element is expedient. Thus, in cases of weak gastric digestion, it is not advisable to mix starchy food with the albuminous, as it soaks up the too scanty gastric juice without making any use of it. In such cases, moreover, articles of food like potatoes, new bread, pastry, etc. are apt to turn acid in the stomach, and check digestion. There are, again, some cases of gastric disorder in which a purely starchy diet is expedient. Thus, according to Dr. Chambers, it is the best form of food "during acute catarrhal bilious attacks at the commencement of treatment, in even chronic gastric cases, and whenever a dusky complexion, hypochondriasis, or general distress show that arrested molting has caused a collection in the body of effete tissues" (*Dietetics in Clinical Lectures*, 4th ed., p. 539). In the early stages of rheumatic fever and other acute diseases, it is usually expedient to limit the diet of the patient for a day or two to a purely starchy diet, such as arrowroot, tapioca, panado, etc. In returning from a purely starchy to a mixed diet, Dr. Chambers suggests that such an arrangement shall be adopted as to prevent starchy and albuminous foods from being together in the stomach. For example, let the morning and evening diet be vegetable, with a mid-day meal of purely animal food. It should be recollected that although starch is converted into sugar by the saliva, pancreatic fluid, and intestinal juice (see DIGESTION), the change principally takes place from the action of the two last-named fluids in the small intestine. Hence, when the duodenum, jejunum, or ileum are morbidly affected, as in typhoid or enteric fever, in enteritis, in diarrhea, etc., little or no starch should be given in the food.

Wheat starch is the only variety of starch admitted into the pharmacopœia. It is employed in medicine chiefly in the form of mucilage (prepared by triturating 120 grains of starch with 10 fluid ounces of distilled water gradually added, and boiling for a few minutes, constantly stirring). This preparation is used either alone or as a vehicle for more active agents, as an enema, in dysentery, diarrhea, flatulent distention of the bowels, etc.; externally, it is used as an application to excoriations, to prevent bed-sores, etc., and as a basis for dusting-powders in various forms of discharging skin-diseases. Its use in surgery for the construction of immovable bandages has been noticed in the article SPLINTS.

STAR-CHAMBER, a tribunal of considerable note in English history, which met in the old council-chamber of the palace of Westminster, and is said to have its name from the circumstance that the roof of that apartment was decorated with gilt stars. It is

generally supposed to have originated in early times out of the exercise of jurisdiction by the king's council, acting as the *concilium ordinarium* and not *privatum*. The powers of the council, however, had been abridged by several acts of Edward III., and had altogether greatly declined when act 3 Henry VII. c. 1, either revived and remodeled them, or instituted, according to the view taken by Mr. Hallam, an entirely new tribunal. This statute conferred on the chancellor, the treasurer, and the keeper of the privy seal, with the assistance of a bishop and a temporal lord of the council, and chief-justices, or two other justices in their absence, a jurisdiction to punish without a jury, the misdemeanors of sheriffs and juries, as well as riots and unlawful assemblies. Act 21 Henry VIII. c. 20, added to the other members of the court the president of the council. Whether or not the above-cited act of Henry VII. meant to constitute a court distinct from the council, it is certain that, by the time of Elizabeth, the two jurisdictions were merged in one: and the resulting tribunal was, during the Tudor age, of undoubted utility as a means of bringing to justice great and powerful offenders who would otherwise have had it in their power to set the law at defiance. The civil jurisdiction of the star-chamber, at that period, comprised controversies between English and foreign merchants, testamentary causes, disputes between the heads and commonalty of corporations, lay and ecclesiastical, and claims to deodands. As a criminal court, it could inflict any punishment short of death, and had cognizance of forgery, perjury, riots, maintenance, fraud, libels, conspiracy, misconduct of judges and others connected with the administration of the law, and all offenses against the state, in so far as they could be brought under the denomination of contempts of the king's authority. Even treason, murder, and felony could be brought under the jurisdiction of the star-chamber, where the king chose to remit the capital sentence. The form of proceeding was by written information and interrogatories, except when the accused person confessed, in which case the information and proceedings were oral; and out of this exception grew one of the most flagrant abuses of this tribunal in the later period of its history. Regardless of the existing rule, that the confession must be free and unconstrained, pressure of every kind, including torture, was used to procure acknowledgments of guilt; admissions of the most immaterial facts were construed into confessions; and fine, imprisonment and mutilation inflicted on a mere oral proceeding, without hearing the accused, by a court consisting of the immediate representatives of prerogative. The proceedings of the star-chamber had always been viewed with distrust by the commons; but during the reign of Charles I., its excesses reached a height that made it absolutely odious to the country at large; and in the last parliament of that sovereign, a bill was carried in both houses (16 Car. I. c. 10), which decreed its abolition.

STAR-FISH, *Asteriada*, a family of *echinodermata* (q.v.) having in the center of the body a stomach with only one aperture, but extending, by two much-branched cæca, into each of the rays into which the body is divided. In some the central disk extends so as to include the rays, so that the general form is angular or lobed; in others the disk is very small in comparison with the length of the rays. Locomotion is effected by very numerous ambulacra (q.v.) placed in rows on the underside of the rays. A bony framework, of a vast number of pieces, extends to the extremity of each ray. The nervous system has its center around the mouth, and sends a filament to each ray. Star-fishes are hermaphrodite, and produce vast numbers of eggs, which are retained for a time under the body of the parent, resting on the points of its rays at the bottom of the sea, and raising up the center of the body, in order as it were to hatch them. The young are destitute of rays, and very unlike the mature form, so that their real nature was long mistaken. The mouth of star-fishes being on the under side, they seek their food—as indeed they perform all their motions—by crawling at the bottom of the sea, or on rocks, etc. They are very voracious, and are troublesome to fishermen by devouring their bait. They possess, in a very high degree, the power of reproducing lost members; a disk with a single ray left will reproduce the other rays and become a perfect star fish. More extraordinary is the readiness which many of them display, particularly those with long and slender rays, in breaking off these members. Some species—**BRITTLE STARS**—can scarcely be procured for a museum in a tolerably perfect state, because they throw off ray after ray, and, in fact, break themselves to pieces upon any alarm. Star-fishes abound in the seas of all parts of the world. Almost no object is more familiar on the sea-coast of America than the **COMMON STAR-FISH**, **CROSS-FISH**, or **FIVE FINGERS** (*Asterias* or *Uraster rubens*), thrown up on the beach by the tide, or thrown out of fishing-boats in harbors. Some of the species are much larger; and some exhibit very beautiful colors; whilst others are interesting from their structure—the long serpent-like form of their rays, or the division of the rays by successive forkings, so that the whole creature is a globular mass, the surface of which is formed of a countless multitude of living tendrils. See illus., **INVERTEBRATES**, vol. VIII., figs. 13, 22.

STAR-FORT, in field fortification, is a strong work consisting of alternate salient and re-entering angles, arranged on a regular or irregular polygon. It is a common work for defending an eminence on a battle field, or at the wing of a line, or as protection for the reserve-stores of an army.

STARGARD (Släv. *Starograd* or *Starigrod*, i.e., Old Town), a t. of Germany, province of Pomerania, is situated on the navigable river Ihna, 22 m. e. s. e. of Stettin, with

which, as with Posen and the whole east of Prussia, it is connected by railroad. Star-gard was formerly the capital of Lower Pomerania. Its manufactures include machinery, shoes, felt, soap, brushes, spirits and cigars. Pop. '90, 23,792.

STAR-GAZER, certain species of acanthopterous fishes of the genus *uranoscopus*. The eyes are near together on the top of the head, and therefore always looking upward, a circumstance to which they owe their name. They are spiny and ugly in appearance. In front of the tongue there is a long filament which can be protruded at will. The best known species are *u. scaber* of the Mediterranean, and *u. anoplos* of our South Atlantic coast, but most of the species are found in East Indian seas.

STARIN, JOHN HENRY, b. Sammonsville, N. Y., 1827; was a druggist in Fultonville, N. Y., 1845-48; became interested in shipbuilding and the transportation business, as well as in banking and stock-raising, and has greatly prospered. He was elected, as a repub., to the XLVth and XLVith congresses.

STAR JELLY. See Nostoc.

STARK, a co. in n.w. Illinois, intersected by the Rock Island and Peoria railroad and a branch of the Chicago, Burlington and Quincy railroad; 290 sq. m.; pop. '90, 9982, chiefly of American birth. It is drained by Spoon river, raising in its n. portion. The surface is hilly, containing beds of bituminous coal which is mined. Co. seat, Toulon.

STARK, a co. in s.w. N. Dakota, formed 1879; pop. '90, 2304. Area, 1310 sq. m. Co. seat, Dickinson.

STARK, a co. in n.e. Ohio, drained by the Nimishillen, the Sandy, and Sugar creeks; 560 sq. m.; pop. '90, 84,170, chiefly of American birth. It is intersected by the Cleveland terminal and Valley, the Cleveland, Canton, and Southern, and the Pennsylvania Co.'s railroads. Co. seat, Canton.

STARKE, JOHN, 1728-1822, b. N. H., a captain in the French and Indian war, who distinguished himself in the expedition to Ticonderoga in 1758. He was commissioned col. in 1775, and raised a regiment which was at Bunker Hill on the left of the American line. He joined the expedition against Canada, was at the front at Trenton and took part in the battle of Princeton. In 1777 he raised a new regiment in New Hampshire, but soon left it, thinking himself neglected by congress. At the head of New Hampshire troops he fought the battle of Bennington, Aug. 16, 1777, and was soon made brig.-gen., and thanked by congress, which had previously censured him for disobeying Gen. Lincoln's orders to march to the west. With a new force of New Hampshire recruits, he prevented Burgoyne's retreat from Saratoga. He commanded the northern department in 1778, and again in 1780, and was on the court-martial which condemned André.

STARKE, a co. in n.w. Indiana; drained by the Yellow and Kankakee rivers, the latter its n.w. boundary; traversed by the Pennsylvania Co.'s railroad; 300 sq. m.; pop. '90, 7339, chiefly of American birth. The surface is partly prairie and partly woodland, and diversified by small lakes; hay, corn, wheat, and cattle are staples. Co. seat, Knox.

STARKEY, THOMAS ALFRED, S.T.D., b. 1824, in Philadelphia: was educated for a civil engineer; but, having studied theology, was ordained priest in the Prot. Epis. church, 1848. He held pastorates at Troy, Albany, Cleveland, Washington, and Paterson, N. J.; and was consecrated bp. of Northern N. J., 1880.

STARLING, *Sturnus*, a Linnæan genus of birds of the order *insectorcs*; now the family *sturnide*; nearly allied to *corvidæ*, but in general of smaller size; the bill more slender and compressed, its point nail-like; the wings long and pointed. They are natives of almost all parts of the world, very generally gregarious, and some of them migratory. They feed on worms, insects, larvæ, and fruits. Some of them follow herds of quadrupeds, on account of the insects which attend them. The COMMON STARLING (*Sturnus vulgaris*) is a beautiful bird, rather smaller than the song-thrush or mavis, brown, finely glossed with black, with a pale tip to each feather, giving the bird a fine speckled appearance, particularly on the breast and shoulders; in advanced age it is more uniform in color. The plumage of the female is less beautiful than that of the male. Both sexes are more speckled in winter than in summer. The starling is abundant in most parts of Britain, and nowhere more so than in the Hebrides and Orkneys. It is very abundant in the fenny districts of England. It is found in all parts of Europe and throughout great part of Africa; and is also common in the n. of Asia. Starlings make artless nests of slender twigs, roots, and dry grass, in hollow trees, in holes of cliffs, under eaves of houses, or, readily enough, in boxes, which are often placed for them in trees or elsewhere near houses. They frequently breed twice in a season, and in autumn they unite in large flocks. The starling becomes very pert and familiar in confinement, displays great imitative powers, and learns to whistle tunes, and even to articulate words with great distinctness. Its natural song is soft and sweet.—The AMERICAN STARLING or MEADOW LARK (*S. ludovicianus*), is larger than the common starling. It is common in the United States, migrating northward in spring, and southward in autumn, and congregating in great flocks in autumn and winter. See *illus.*, LARKS, ETC., vol. VIII., fig. 11.

STAR-NOSE, *Condylura* or *Astromyctes*, a genus of the mole (q.v.) family, *talpidae* having much general resemblance to moles, but with a longer tail and an elongated slender muzzle, which bears at its extremity a remarkable structure of fleshy and somewhat cartilaginous rays disposed in a star-like form. The habits are very similar to those of moles. All the species of this genus are natives of North America. The best known is *condylura cristata*, which inhabits Canada and the eastern parts of the United States.

STARODOUB, a t. of European Russia, in the government of Tchernigov, and 100 m. n.e. of the town of that name. It stands in the middle of a fertile district, but at a distance from any commercial highway. Pop. '94, 25,294.

STAR OF BETHLEHEM, *Ornithogalum*, a genus of bulbous-rooted plants of the natural order *liliaceæ*, nearly allied to squills and hyacinths. The species are pretty numerous, natives almost exclusively of the eastern hemisphere, many of them of the cape of Good Hope, and some of the s. of Europe. The common star of Bethlehem (*O. umbellatum*), a native of France, Switzerland, Germany, the Levant, etc., is very common in flower-gardens. Its flowers are large, six to nine in a corymbose raceme, white and somewhat fragrant.

STAR OF INDIA, THE MOST EXALTED, THE ORDER OF THE, an order of knighthood instituted by queen Victoria in June, 1861, with the view of affording the princes, chiefs, and people of the Indian empire a testimony of her majesty's regard, commemorating her majesty's resolution to take on herself the government of India, and rendering honor to merit and loyalty. The order consists of the sovereign, a grand-master, who is to be the governor-general of India for the time being, and 25 knights, together with such extra and honorary knights as the crown may appoint. The members of the order are to be military, naval, and civil officers who have rendered important service to the Indian empire, and such native chiefs and princes of India as have entitled themselves to her majesty's favor. The insignia consist of a collar, badge, and star. The *collar* of the order is composed of the heraldic rose of England, two palm branches in saltire tied with a ribbon, and a lotus-flower alternating with each other, all of gold enameled, and connected by a double golden chain. From an imperial crown, intervening between two lotus-leaves, depends the *badge*, consisting of a brilliant star of five points, and hanging from it an oval medallion, with an onyx cameo profile bust of queen Victoria, encircled by the motto: "Heaven's light our guide," in gold letters, on an enriched border of light-blue enamel. The *investment badge* is similar to the collar-badge, but with the star, the setting of the cameo, and the motto all of diamonds: it is worn pendent from a ribbon of pale blue with white borders. The *star* of the order is a five-pointed star or mullet of diamonds on an irradiated field of gold. Around it, on an azure fillet bordered with gold, is the same motto in diamonds, the whole encircled by wavy rays of gold.

STARR, a co. in s. Texas adjoining Mexico, and bounded on the s. by the Rio Grande; about 2570 sq.m.; pop. '90, 1052, chiefly of American birth, with colored. Surface, prairie land, in which water and timber are scarce; sheep and cattle raising is the main occupation. Co. seat, Rio Grande.

STARR, MOSES ALLEN, an American neurologist, b. in Brooklyn, N. Y., May 16, 1854; educated at Princeton, the College of Physicians and Surgeons in N. Y., the universities of Berlin, Heidelberg, Vienna and Paris, he became, in 1886, professor of nervous diseases in the New York Polyclinic, and in 1888 professor of diseases of the mind and nervous system at the college of Physicians and Surgeons. He has published, *Familiar Forms of Nervous Diseases* (1890); *Lectures on Insanity* (1891); *Brain Surgery* (1893).

STARRS, WILLIAM, b. Ireland, 1807; studied Roman Catholic theology at Maynooth; came to America, 1828; entered the Sulpician seminary, Baltimore; was curate of St. Patrick's, New York, 1834-44; pastor of St. Mary's church, 1844-53; rector of St. Patrick's and vicar-general of the diocese of New York; had charge of the diocese from the death of archbishop Hughes, 1864, to the consecration of Dr. McCloskey. 'D. 1873.

STARS are distinguished from planets by remaining apparently immovable with respect to one another, and hence they were early called fixed stars, a name which they still retain, although their perfect fixity has been completely disproved in numerous cases, and is no longer believed in regard to any. Twinkling, or scintillation (q.v.), is another mark which distinguishes stars from planets.

The first thing that strikes the observer is the apparent daily motions of the stars. The greater part appear to rise in the e., describe smaller or greater arcs in the heavens, and set in the west; while others describe complete circles around a point n. of the zenith, that described by the so-called polar star being the smallest visible to the naked eye. These apparent motions arise from the rotation of the earth on its axis. Had the earth only this rotatory motion, the aspect of the starry heavens at any spot on the earth's surface would be the same at the same hour of the night all the year round; which is known not to be the case.

With few exceptions, the distance of the fixed stars is still unknown, and must in all be enormously great. Since the time of Bradley, many attempts have been made to measure what is called the *yearly parallax* of the stars, and thus determine their distances. When we consider that the motion of the earth round the sun brings us at one time a

whole diameter of its orbit (184 millions of miles) nearer to a particular region of the heavens than we were six months before, we should expect a change in the relative distances of the stars as seen from the two points—that as we approach them they should seem to separate. But no such change is seen to take place; and this was one of the early objections to the theory of Copernicus. The only answer that the Copernicans could give was, that the distance of the stars from us is so great that the diameter of the earth's orbit is as a point compared with it. The detection of the parallax of the fixed stars depended upon the perfection of instruments. The parallax of a star is the minute angle contained by two lines drawn from it, the one to the sun, the other to the earth. If that angle amounted to a second, the distance of the star would be 206,000 times that of the sun; and when the measurement of angles came to be reliable to a second, and still no parallax was discernible, astronomers could say that the distance of the nearest stars must be more than 206,000 times that of the sun—i.e., 206,000 times 92 millions of miles, or about 20 billions of miles. It is only since between 1832 and 1838 that anything like positive determinations of parallax have been made, chiefly by Henderson, Bessel, and Peters. The first published (Dec., 1838) was that of the double star 61 in the constellation of the Swan, by Bessel, who made the parallax $37''.0$, giving a distance over 550,000 times that of the sun, or 52 billions of miles, so that the light of this star is about $8\frac{1}{2}$ years in reaching the earth. The nearest of all the stars yet measured is α Centauri, the finest double star in the southern heavens, whose parallax was determined by Henderson and Maclear at the cape of Good Hope to be $0.9128''$ (the observations were made in 1832-33; the result read before the Astronomical society, Jan., 1839), or as subsequently corrected, $0.976''$, corresponding to a distance of about 20 billions of miles, and requiring $3\frac{1}{2}$ years for its light to reach us. To Sirius, the brightest of the stars, a parallax of $0.15''$, has been assigned, implying a distance six times that of α Centauri. "It has been considered probable, from recondite investigations, that the average distance of a star of the *first* magnitude from the earth is 986,000 radii of our annual orbit, a distance which light would require $15\frac{1}{2}$ years to traverse; and further, that the average distance of a star of the *sixth* magnitude (the smallest distinctly seen without a telescope) is 7,600,000 times the same unit—to traverse which, light, with its prodigious velocity, would occupy more than 120 years. If, then, the distances of the majority of stars visible to the naked eye are so enormously great, how are we to estimate our distance from those minute points of light discernible only in powerful telescopes? The conclusion is forced upon us that we do not see them as they appeared within a few years, or even during the lifetime of man, but with the rays which proceeded from them several thousands of years ago!"—Hind's *Astronomy*.

The stars have been divided into groups called constellations (q.v.) from the earliest times. The several stars belonging to the same constellation are distinguished from one another by Greek letters, beginning the alphabet with the brightest; and when these are not sufficient, by Roman letters and by numbers. Many of the most brilliant stars have special names. They are also divided according to their brightness into stars of the first, second, third, etc., magnitudes—a division which is necessarily somewhat arbitrary. The smallest stars discernible by a naked eye of ordinary power are usually called stars of the fifth magnitude; but an unusually sharp eye can discern those of the sixth and even seventh magnitude. All below are *telescopic* stars, which are divided in a very undetermined way down to the twentieth magnitude. Sir J. Herschel has determined that the light of Sirius, the brightest of all the stars, is 324 times that of a mean star of the sixth magnitude. By processes of photometric observation and reasoning, it is concluded that the intrinsic splendor of α Centauri is more than twice that of our sun, and that of Sirius 394 times. Among stars of the first magnitude in the northern hemisphere are usually reckoned Aldebaran (in Taurus), Arcturus (in Bootes), Atair (in Aquila), Betelgeux (in Orion), Capella (in Auriga), Procyon (in Canis Minor), Regulus (in Leo), Vega (in Lyra). In the southern hemisphere are Achernes (in Eridanus), Antares (in Scorpio), Canopus (in Argo), Rigel (in Orion), Sirius (in Canis Major), Spica (in Virgo), and α Centauri and α Crucis that have no special names.

No apparent magnitude, in the proper sense of the word, has yet been observed in any star. In the best and most powerfully magnifying telescopes, even the brightest stars of the first magnitude appear, not with small disks as all the planets do, but as luminous points without any visible diameter, and always the smaller the better the telescope. We are therefore totally ignorant of the real size of the fixed stars; nor could it be determined though we were sure of their distances, for the apparent diameter is an essential element in the calculation. We cannot, then, say whether the greater brilliancy of one star, when compared with another, arises from its greater nearness, its greater size, or the greater intensity of its light. It is certain that all the fixed stars are self-luminous. By the spectroscope several facts regarding their physical constitution have been made out; there are great differences in their spectra; the existence of several known elements is considered demonstrated. Sirius, e.g., contains hydrogen, sodium, and magnesium.

The number of the stars is beyond determination. Those visible by the naked eye amount only to a few thousands. Stars of the first magnitude are usually reckoned at 15 to 20, of the second at 50 to 60, of the third about 200, of the fourth at 400 to 500, of the fifth at 1100 to 1200. But in the following classes, the numbers increase rapidly, so

that stars of the sixth and seventh class amount to above 12,000. Stars are most dense in that region of the heavens called the Milky Way, which is mostly composed of stars of the eleventh and twelfth magnitudes. W. Herschel observed 116,000 stars pass the field of his telescope in a quarter of an hour, while directed to the densest part of the Milky Way.

That the fixed stars are not really immovable, as their name would imply, is seen in the phenomenon of *double or multiple stars* which are systems of two or more stars that revolve about one another, or rather about their common center of gravity. As they can be seen separate only by means of a telescope, and in most cases require a very powerful one, their discovery was possible only after the telescope was invented. Galileo himself discovered their existence, and proposed to make use of them in determining the yearly parallax of the fixed stars. After a long lapse of time, Bradley, Maskelyne, and Mayer again directed attention to the phenomena of double stars; but nothing important was made out respecting them till the elder Herschel made them the subject of a protracted series of observations, which led to the most remarkable conclusions as to their nature. The united observations of Struve, Savary, Encke, South, and especially those of Herschel the younger, continued for four years in the southern hemisphere at the cape of Good Hope, have raised the number of observed double, or rather multiple, stars to more than 6,000, of which the greater part are binary, or composed of two, but many are triple, some quadruple, and a few even quintuple, or consisting of five stars. The distance between the stars composing these systems is always apparently small (varying from less than 1" up to 32"); but apparent nearness does not always constitute a double star, for two really distant stars are not unfrequently so nearly in the same line, as seen from the earth, that they appear to be close together. In real multiple stars, the individuals are not only comparatively near to one another, but they revolve around one another. Among stars of the first three magnitudes, every sixth is a multiple star; among the smaller stars, the proportion is much less. In some cases, one of the stars is much larger than the other, as in the star Rigel in Orion, and in the polar star; but oftener the connected stars are nearly equal in luminous power. The two members of double stars are mostly of one color, but a difference of color is observed in about one-fifth of the whole number. In many of these cases, the one color is the complement of the other, and it is possible that the color of the smaller star may be subjective, arising from the action of the other upon the eye.

It was in 1803, after 20 years' observation, that sir W. Herschel advanced the view, which has been more and more confirmed since, that double stars are connected systems of two or more stellar bodies, revolving in regular orbits around one another, or rather round their common center of gravity. Their motions are found to follow the same laws as prevail in the solar system, and the orbits are elliptical. These distant bodies are therefore subject to the Newtonian law of gravitation. The period of revolution has, in several cases, been roughly approximated; among the shortest is that of ζ Herculis, estimated at 30 years; others are set down at hundreds. In cases where the parallax is known, the size of the orbits can be determined; and thus the astronomer is able to assert in regard to the double star 61 Cygni that the orbit described by these two stars about each other undoubtedly greatly exceeds in dimensions that described by Neptune about the sun. Even the masses of these stars have been calculated as being together 0.353, that of our sun being 1. It is a consequence of these revolutions that many stars are now seen double that formerly seemed single, and *vice versé*. If the plane of revolution have its edge presented to the earth, the stars will seem to move in a straight line, and at times to cover one another. The star ζ Herculis, seen by Herschel double in 1781, appeared single in 1802, and was first seen double again by Struve in 1826. The period of revolution is presumed to be 182 years.

The *proper motion* of stars, discovered by Halley, is of another kind. It consists in a displacement in various directions of the individual stars, so that the configuration of constellations is slowly changing. "The Southern Cross," says Humboldt, "will not always shine in the heavens exactly in its present form; for the four stars of which it consists move with unequal velocity in different paths. How many thousand years will elapse before its total dissolution cannot be calculated." The proper motions yet observed vary from $\frac{1}{20}$ of a second to 7.7". According to Bessel, the proper motion of the binary star 61 Cygni amounts to 5.123", so that in 360 years it would pass over a space equal to the moon's diameter. It must thus take thousands of years to alter sensibly the aspect of the heavens; although, taking into account the enormous distances, the actual velocities must be great. Of 3,000 stars observed by Bessel, 425 had a perceptible motion. Argelander has recently published a list of 560 stars having a proper motion.

It was first observed by sir W. Herschel that there is a perceptible tendency in the stars generally to diverge or open up in one quarter of the heavens, and to draw together in the opposite quarter; and this he attributed to a proper motion of our sun with his planets in the direction of the former point. The apparent motion thus caused is complicated with the real independent motions of individual stars. The point toward which this motion is directed, which is called the "solar apex," was fixed by Herschel in the constellation Hercules; and the result of subsequent and independent researches gives a nearly coincident point. The velocity has been calculated at upward of 150 millions of

m. a year, or 17,600 m. an hour—i.e., rather more than one-fourth of the earth's velocity in its orbit.

The spectroscope has been applied to investigate the physical constitution of the stars, with the result of identifying many of the elements composing our sun and earth. The spectra of the stars differ greatly among one another; some consisting mainly of simple lines, others having complex bands. The simple spectra are believed to indicate great intensity of heat, keeping the molecules of matter in a state of extreme dissociation; while the complex spectra show the molecules to be more associated in groups or compounds, owing to the repulsive force being less. The bluish stars are the hottest; a red tinge indicates comparative coolness. Our sun would seem to be a decaying star.

Several stars exhibit well-marked periodic alterations of a striking nature, and are hence called *variable stars*. A considerable number have been observed, of which the most remarkable are Mira (the "wonderful") in Cetus, and Algol in Perseus. The first attains its greatest luster every 334 days, and appears for 14 days as a star of the second and even at times of the first magnitude; it then decreases for two or three months, till it becomes of the sixth and even tenth magnitude, so as to be for half a year invisible to the naked eye and usually to telescopes. After this it begins again to increase, but more rapidly than it decreased. It is visible to the naked eye for three or four months of its period. Of all the variable stars yet observed in Perseus, Algol has the shortest period, being 68 hours 49 minutes. It appears for about 60 hours a star of the second magnitude, then decreases for four hours, and appears for a quarter of an hour of the fourth magnitude, after which it increases again for four hours. Various explanations have been offered of these mysterious appearances; the stars are supposed to turn on their axes, and to have their surfaces unequally luminous in different places; or a large dark body is assumed to be revolving about the luminous one, so as to intercept more or less of its light in different positions; or the stars are lens-shaped, etc. There is nothing, however, inadmissible in the supposition that the intensity of the light itself may vary; and if in other suns, why not in our own?

Allied to the variable stars are the *new* or temporary stars that appear suddenly in great splendor, and then disappear without leaving a trace. A number of instances are on record. It is not impossible that these also may be periodic.

Star Systems.—From the appearances connected with the Milky Way or Galaxy (q.v.), sir W. Herschel came to the conclusion that the stars forming our firmament do not extend indefinitely into space, but are limited in all directions, the mass having a definite shape. He conceived the shape to be something like that of a huge millstone, having one side cleft, and the two laminae set apart at a small angle. Let the diagram

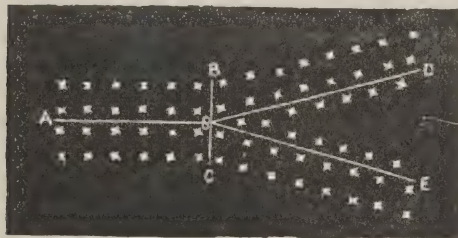


FIG. 1.

(fig. 1) represent a vertical section of such a broad flat stratum, and suppose the solar system situated as at S, to a spectator looking on either side, in the direction of the thickness, as SB, the stars would appear comparatively sparse, but all round in the direction of the breadth (as SA) there would appear a dense ring, which would separate into two branches (SE, SD) in the direction of the cleft side. This supposition accounts for the appearance of the Milky Way, and all subsequent obser-

uations have tended to confirm the conjecture.

But this star system, which we may call our own, as our sun belongs to it, is but an item in the stellar universe. The appearances known as nebulae, in many cases, at least, are believed to be similar agglomerations of suns, separated from our system and from one another by unfathomable starless intervals (see NEBULÆ). Their forms are very various, but in general pretty well defined, and not without symmetry. A new star was discovered, in the center of the great nebula in Andromeda, Aug. 31, 1885.

STARS AND BARS. The flag of the Southern Confederacy as distinguished from the Stars and Stripes. It consisted of three horizontal bars of equal width—the two outer red, the inner white—and of a blue square in the upper corner by the staff, terminated by the lower red stripe. This square contained a circle of stars equal to the number of states. "The bars were by their colors, red and white, intended to express the qualities of courage and purity. The field of the union was blue, to express fortitude"—Jefferson Davis. This, the early flag of the Confederacy, was changed at least twice. See FLAGS.

STAR SPANGLED BANNER, THE, American national hymn, written by Francis Scott Key (1780-1843), on board the frigate *Surprise* during the bombardment of Fort M'Henry, Md., by the British, in 1814. He had gone there to release a friend captured by the enemy, but was not permitted to return to Baltimore. He witnessed the engagement all night, and at dawn when he saw the "Star Spangled Banner" still floating from the ramparts, he wrote the verses, which on his arrival in Baltimore, he had printed, with the direction that they should be sung to the tune of "Anacreon in Heaven," composed

in England by John Stafford Smith between 1770-75. The Star Spangled Banner was first sung in a tavern near the Holiday street theatre, Baltimore, by Ferdinand Durang. It is contained in Key's poems, published by Roger B. Taney (New York, 1857). Concert variations on this air for the organ were written by John Knowles Paine and by Dudley Buck. See Helen K. Johnson, *Our Familiar Songs* (New York, 1881).

STAR-THISTLE. See CENTAUREA.

STARVATION, or **INANITION**, are terms applied to the phenomena resulting from an entire deficiency, or an insufficient supply of food. From M. Chossat's well-known experimental investigations of this subject (*Recherches Expérimentales sur l'Inanition*, Paris, 1843), it appears that the average loss of weight in mammals and birds, between the commencement of fasting and the death of the animal, was 40 per cent, the loss varying above and below 40 per cent. in the different organs and tissues, as shown in the following table :

PARTS WHICH LOSE MORE THAN FORTY PER CENT.		PARTS WHICH LOSE LESS THAN FORTY PER CENT.	
Fat.....	93.3	Muscular coat of the stomach.....	39.7
Blood.....	75.0	Pharynx and Œsophagus.....	34.2
Spleen.....	71.4	Skin.....	33.3
Pancreas.....	64.1	Kidneys.....	31.9
Liver.....	52.0	Lungs.....	22.2
Head.....	44.8	Bones.....	16.7
Intestines.....	42.4	Eyes.....	10.0
Muscles of locomotion.....	42.3	Nervous system.....	1.9

Hence it appears that there is an almost complete removal of the fat, and a great reduction of the blood, while the nervous system is scarcely affected; and hence it would seem as if the supervention of death was coincident with the consumption of all the combustible materials of the body, and that previously the remaining nutritive force was concentrated on the nervous system.

The following are among the most prominent phenomena which Chossat observed either during the experiments or after the death of the animals: 1. Dropsical effusion. 2. Softening and destruction of the mucous membrane. 3. Blackening of the viscera, especially of the liver. 4. Bluish, livid, yellow, and reddish stains during life in the transparent parts of the skin. 5. Hectic fever, and a continuous decrease in the power of the body to resist cold. 6. At first a scanty excretion of dry, bilious, grass-green fæces, and afterward diarrhea of liquid saline matter. 7. Convulsions similar to those in death by hemorrhage. 8. Death by starvation seems to be in reality death by cold; since the temperature of the body is not much diminished until the fat is nearly consumed, when it rapidly falls, unless it be kept up by heat applied externally. 9. Young animals succumbed far sooner than adults. 10. The results of insufficient food were in the end the same as those of total deprivation; the total amount of loss being almost the same, but the rate being less, so that a longer time was required to produce it.

Chossat did not find that much influence was exerted on the duration of life by permitting or withdrawing the supply of water; but there is no doubt that in man, and probably in mammals generally, death supervenes much earlier when liquids as well as solid food are withheld. For a full account of the symptoms of starvation as they occur in the human subject, we must refer the reader to the writings on hygiene and forensic medicine of Orfila, Rostan, Caspar, Taylor, etc.; and especially to Dr. Donovan's account of the Irish famine of 1847, in the *Dublin Medical Press*, Feb., 1848, p. 67. The following are the most striking symptoms: In the first place, pain is felt in the stomach, which is relieved on pressure. The countenance becomes pale and cadaverous; the eyes are wild and glistening; the breath hot, the mouth parched, and the saliva thick and scanty. An intolerable thirst supervenes, which, if there be no access to water, becomes the most distressing symptom. The body becomes gradually emaciated, and begins to exhale a peculiar fetor, while the skin becomes covered with a brownish dirty-looking and offensive secretion almost as indelible as varnish, which Donovan at first mistook for encrusted filth. The bodily strength rapidly declines; the sufferer totters in walking, like a drunken man; his voice becomes weak and whining, and he is ready to burst into tears on the slightest occasion. In the cases recorded by Donovan, imbecility, and sometimes almost complete idiocy, ensued, but in no instance was there delirium or mania, which has been described as a symptom of starvation in cases of shipwreck. On examination after death, the condition of the body is such as might be expected from Chossat's experiments, viz., extreme general emaciation; loss of size and weight of the principal viscera; almost complete bloodlessness, except in the brain; and the gall-bladder distended with bile, which tinges the neighboring parts. Moreover, decomposition rapidly ensues.

It is impossible to fix the exact time during which life can be supported under entire abstinence from food or drink. Dr. Sloan has given an account of a healthy man, aged 65, who was found alive after having been shut up in a coal mine for 23 days, during the first ten of which he was able to procure a small quantity of foul water. He was in a state of extreme exhaustion, and notwithstanding that he was carefully nursed, he died three days after his rescue. Dr. Willan records the case of a young gentleman who, under the influence of religious delusion, starved himself to death. He survived for sixty days, during which time he took nothing but a little orange juice. In this

case, life was probably abnormally prolonged in consequence of the peculiar emotional excitement of the patient. Judging from the cases of abstinence owing to disease of the throat and impossibility of swallowing, Dr. Taylor infers "that in a healthy person under perfect abstinence, death would not commonly take place in a shorter period than a week or ten days."

It is worthy of notice that a deficient supply of food seems to check the elimination and removal of the effete materials of the body. This fact accounts not only for the tendency to putrescence, which is exhibited during the process of starvation, and for the rapidity with which putrefaction ensues after death, but for the pestilential diseases which almost always follow a severe famine; the excess of disintegrated matter in the blood rendering the system especially prone to the reception and multiplication of the diseases characterized as zymotic, such as fever, cholera, etc.

STASSFURT, a t. in Prussia, province of Saxony, on the Bode river, in the vicinity of the Hartz mountains, 20 m. s. of Magdeburg; pop. '95, 18,981. There are manufactures of chemicals, and much salt is produced in the neighborhood.

STATANT, in heraldry, a term applied to an animal standing still, with all the feet touching the ground. If the face be turned to the spectator, it is said to be *statant gardant*, or in the case of a stag, *at gaze*.

STATEN ISLAND, an island of New York, formerly constituting the co. of Richmond; after Jan. 1, 1898, constituting the borough of Richmond in the Greater New York. It is irregular in shape; extreme length, 13 miles; extreme breadth, 8 miles; area, about 60 sq. miles; bounded on the n. by the Kill von Kull, separating it from New Jersey, and by Newark bay, on the e. by New York harbor, on the s. by the lower New York bay; judicial seat, Richmond. On its e. shore at the Narrows are fort Wadsworth and a line of water batteries; on the n. shore is the Sailors' Snug Harbor, an asylum for aged and infirm seamen; and on its lower bay shore is South Beach, a summer resort. It is connected with New York and Perth Amboy, N. J., by steam ferries at St. George and Tottenville, is well supplied with steam and electric railroads; and by a bridge across the Arthur Kill. Its steam railroad joins the Baltimore and Ohio system at Elizabeth, N. J. The towns are Castleton (co-extensive with New Brighton villages), Middleton, Northfield, Southfield, and Westfield; the villages, New Brighton, Port Richmond, Edgewater, Tottenville, Linoleumville, Stapleton, and Tompkinsville. The island is a favorite residence place of New York business men, and has all the advantages of a large city. Pop. '90, 51,693.

STATEN ISLAND, an island off the s.e. point of Tierra del Fuego, from which it is separated by the strait of Le Maire. It is about 45 m. in length from e. to w. and about 10 m. at its greatest breadth, its shores much indented. Its eastern extremity is cape St. John, in lat. 54° 42' s., and long. 63° 43' west. The surface is mountainous, descending to the sea in steep slopes; its general character similar to that of Tierra del Fuego.

STATES, or **ESTATES**, in politics, the name given to the classes of the population who either directly or by their representatives take part in the government of a country. In all European countries where the northern conquerors established themselves, the rudiments of representative government appeared in the form of assemblies brought together to deliberate with the sovereign on the common weal. These assemblies at first consisted of the two estates of the clergy and the nobility or baronage, who together constituted the whole free population of the realm; the nobility including not merely the greater barons, but the whole freeholders. As the burgesses gradually emancipated themselves, and rose into importance, they formed a third estate. In France we find the *tiers état*, or citizens, recognized in the states-general (q.v.) in 1302. In Scotland the earliest occasion on which the burghs are mentioned as attending and concurring in a grant of taxation, is in the parliament held at Cambuskenneth in 1326, in which Robert Bruce set forth to the assembled estates the diminished condition of the royal income in consequence of the protracted struggle through which the country had come. The burgesses represented by the commissioners for the burghs, continued in Scotland to be a separate estate, and were not, as in England, amalgamated with the knights and lesser barons, who, in the Scots parliament, were always classed with the baronage. The lesser barons were, however, first allowed, and latterly enjoined, to appear by representatives; and the three estates of clergy, barons, and burgesses all sat and deliberated in one house. In England, on the other hand, the knights and lesser barons were at an early period separated from the greater barons, and conjoined with the burgesses into the third estate, which occupied a separate chamber from the lords spiritual and temporal. This peculiarity in the original constitution of the *tiers état* of England necessarily gave it a weight which it did not possess elsewhere, and exercised an important influence on the constitutional history of the country. As the peasants became emancipated, we also find them in some countries taking a share in the legislative power, either as a part of the *tiers état*, or, as in Sweden, forming a fourth estate. The four estates of nobles, clergy, citizens, and peasants were recognized in Sweden till 1866; and in the Swedish legislature, as constituted, each had its separate chamber. Throughout Europe, except in Russia (though in some small German states, such as Mecklenburg, the diet, representing only the landed gentry and the towns, has very little authority), the co-operation of the estates with the sovereign in the legislative power is more or less recognized. Some

assemblies have but one chamber, but more of them have two. The lower chamber is always wholly, or partly, elective, but sometimes consists of separate delegates from the different orders of the community, and has representatives of landed proprietors, of towns, of peasants, and of traders and manufacturers. The upper house or senate is in some constitutions hereditary; in some, it consists of members named by the sovereign or by the nobility, or some other class of the community, and often it combines these elements. In a few instances, as in Brazil, it is elected by the same constituency as the lower house, and differs only in the higher property qualification required of its members.

STATES EVIDENCE, a term in common use to describe the testimony of an accomplice in a crime against the other principals, given under an agreement, expressed or understood, with the prosecuting officer, that the informer shall go unpunished in consideration of his aid to the state. Such evidence is regarded as of little value if uncorroborated by other witnesses or circumstances; and it is usual for the court to instruct the jury that it is to be regarded with suspicion unless confirmed in material points by other testimony. It is for the states-attorney or other prosecuting agent to determine in what cases and with which parties an agreement can properly be made without compromising the interest of justice and good order.

STATES-GENERAL (Fr. *états généraux*), the name which was given to the convocation of the representative body of the three orders of the French kingdom; so named in contradistinction from the *états provinciaux*, or assemblies of the provinces. As far back as the time of Charlemagne, there were assemblies of clergy and nobles held twice a year to deliberate on matters of public importance; and in these assemblies the extensive body of laws bearing the name of the capitularies of Charlemagne was enacted. The succeeding centuries, however, were adverse to free institutions; and these national convocations, becoming gradually less important, seem to have ceased to be held about 70 years after Charlemagne's death. From that time forward, there is no trace of any national assembly in France till 1302, when the *états généraux*, including the three orders of clergy, nobles, and citizens, were convened by Philippe le Bel, with the view of giving greater weight to the course adopted by the king in his quarrel with pope Boniface VIII. In 1314 we find the states-general granting a subsidy: during the reigns of Philippe IV. and his successor, the imposition of taxes by arbitrary authority was the subject of general discontent; and in 1355 the states were strong enough to compel the government to revoke the taxes so imposed. The states-general, however, though their consent seems in strictness to have been considered requisite for any measure imposing a general taxation, had, unlike the assemblies under the Carolingian kings, no right of redressing abuses except by petition, and no legislative power. Under Charles VI. and Charles VII. the states-general were rarely convened, and it was often found more convenient to ask supplies from the provincial states. But as the royal authority increased, the formality of any convention of states general or provincial gradually ceased to be regarded as indispensable, and a final and unsuccessful struggle for immunity from taxation took place at the states-general of Tours in 1484. Louis XIII. convoked the states-general, after a long interval, in 1614, but dismissed them for looking too closely into the finances; and from that time down to the revolution, the crown, with the tacit acquiescence of the people, exercised the exclusive powers of taxation and government. In 1789 the memorable convention of the states-general took place, which ushered in the revolution. As soon as they had assembled, a dispute arose between the two privileged orders and the third estate as to whether they should sit and vote in one chamber or separately. The *tiers état*, of its own authority, with such deputies of the clergy as chose to join them—none of the nobles accepting their invitation—assumed the title of the *assemblée nationale*, a name by which the states-general had previously been sometimes designated. See ASSEMBLY NATIONAL.

The name states-general is also applied to the now existing legislative body of the kingdom of the Netherlands (q.v.). It is so called in contradistinction from the provincial states, which are legislative and administrative assemblies for the several provinces.

STATES, NAMES OF.

ALABAMA is an Indian word meaning "here we rest." When the Creek Indians were driven from their hunting grounds in what is now southern Georgia, they fled westward to the banks of a river, where they halted with the exclamation, "Alabama!"

ARKANSAS was named from the "Kansas," an Indian tribe living in that section, and the French prefix "Arc."

CALIFORNIA is a name given by Cortez to all the region north of Mexico, and he is said to have named it from an old Spanish island in romance, the name signifying "an abundance of gold." Others claim it to have originated from the Spanish *caliente formalla*, meaning "hot furnace."

COLORADO is a Spanish word signifying "colored" or "ruddy;" the name was first given to the river on account of the reddish tint of its waters.

CONNECTICUT is named from the Mohican name for the river, *Quonektacut*, meaning "long river."

DAKOTA is a Sioux word signifying "leagued," "allied," or many in one government, referring to the numerous Sioux tribes under one chief.

DELAWARE was named after Thomas West, Lord de la Warr.

FLORIDA was named by Ponce de Leon to commemorate the day of his discovery, *Pasquas de Flores*, or, Feast of Flowers, or, as we call it, Easter Sunday.

GEORGIA was named in honor of George II. of England.

IDAHO is an Indian word meaning the "Gem of the mountains."

ILLINOIS was named after a tribe of Delaware Indians who were called *Illini*, meaning real or superior men, to which was added French *ois*.

INDIANA was named from the word "Indian."

IOWA is the French form of an Indian word meaning the "sleepy ones"—the name of an Indian tribe.

KANSAS is an Indian word signifying "smoky waters," and the state was named from an Indian tribe.

KENTUCKY is from the Indian word *Kantuckkee*, meaning "the dark and bloody ground," in allusion to the bloody fights that used to occur between the tribes who used it as a hunting ground.

LOUISIANA was named in honor of King Louis XIV. of France.

MAINE was named from the province of Maine in France.

MASSACHUSETTS is an Indian word meaning "blue hills."

MARYLAND was named in honor of Henrietta Marie, Queen of Charles I. of England.

MICHIGAN was named from the lake. The word is from two Indian words—*mitchi*, great, and *sawegyan*, lake.

MINNESOTA is an Indian word from the Dakota language meaning "cloudy or sky-tinted waters."

MISSISSIPPI is from two Indian words of the Natchez language, *Miche Sepe*, great river, or, as the Indians called it, the "Father of Waters."

MISSOURI is an Indian word meaning "Mud River;" the state was named from the river.

MONTANA is named from the high mountains that traverse her borders.

NEBRASKA is an Indian word meaning "shallow water and flat country."

NEVADA is a Spanish word signifying "snow clad."

NEW HAMPSHIRE was named from the province of Hampshire, England, originally called *Laconia*.

NEW JERSEY was named after the Isle of Jersey, as a mark of esteem to Sir George Carteret.

NEW YORK was first named New Netherlands, afterwards, New York, in honor of the Duke of York.

NORTH CAROLINA, in honor of Charles II. of England.

OHIO is from an Indian word meaning "very white and beautiful with froth," though some authorities assert that it means "river of blood."

OREGON is an Indian word meaning "fine river of the west." Some assert, however, that the name of the state is derived from the Spanish *oregano*, or wild marjoram, which grows abundantly throughout that section.

PENNSYLVANIA named by William Penn, "Sylvania" or *Forest-land*, to which King Charles II. prefixed "Penn" in honor of Penn's father.

RHODE ISLAND, name first given to the island on which Newport is built, because it looked like the Island of Rhodes in the Mediterranean; others assert that it was named *Roodt Eylandt* from the Dutch, because its shores looked red.

SOUTH CAROLINA, same as North Carolina.

TENNESSEE, from the Indian *Tannasse*, or "River of the Big Bend."

TEXAS is from the Indian *Texas*, signifying "Paradise."

VERMONT is named from two French words, *vert*, green, and *mont*, mountain.

VIRGINIA was named from Queen Elizabeth, who delighted in being called the "Virgin Queen."

WASHINGTON was named after George Washington.

WEST VIRGINIA was formed from the western part of Virginia, and retained the name with the prefix "West."

WISCONSIN is an Indian word meaning the "wild, rushing river."

WYOMING is an Indian word meaning "wide plain."

ALASKA is a corruption of the Indian *Alakshak*, or the "Great Land."

ARIZONA is an Indian word meaning "Blessed Sun."

NEW MEXICO. The word Mexico is formed from *Mexitli*, the name of one of the gods of the Aztecs. Some assert, however, that the word means the "Habitation of the God of War."

UTAH is an Indian word meaning "Contented People." The Mormons call the territory *Deseret* signifying "Virtue and Industry."

STATES, POPULAR NAMES OF.

BADGER STATE. Wisconsin, from the numbers of that animal during its early history.

BAYOU STATE. Mississippi, from the number of bayous or channels within its boundaries.

BEAR STATE. Arkansas, on account of the great numbers of that animal with which it was infested during its early history.

BEAVER STATE. Oregon, from the early fur-trade originally carried on by John Jacob Astor.

BLACK WATER STATE. Nebraska.

BLIZZARD STATE. South Dakota, because of its storms.

BLUE GRASS STATE. Kentucky.

BLUE HEN STATE. Delaware; the name originated during the Revolutionary War, when the commander of a corps, who was a veteran cock-fighter, always bet on the "blue hen's chickens" (his favorite breed of fighters). From this the name came to be applied to the members of his corps, and subsequently to the state.

BLUE LAWS, *Land of*. Connecticut. See BLUE LAWS.

BUCKEYE STATE. Ohio, because the horse chestnut, which grows in great profusion, is commonly called *buckeye*.

BULLION STATE. Missouri, from the sobriquet "Old Bullion" given one of its senators, Mr. Benton. When the charter of the U. S. Bank expired in 1836, he was very outspoken in his financial policy, and made many speeches in which he strongly urged the adoption of gold and silver currency, as the only true remedy for the financial difficulties of the times.

CENTENNIAL STATE. Colorado, because it was admitted into the Union in 1876, or Centennial Year.

CENTRAL STATE. Kansas, a name which seems particularly applicable, not only on account of its geographical position, but also its position in the history of the nation, since it was the Kansas struggles that hastened the climax in politics.

CORN CRACKER STATE. Kentucky, the poor whites being frequently called "Crackers."

COTTON STATE. Alabama.

CRACKER STATE. Georgia; see above.

CREOLE STATE. Louisiana, because of the large proportion of Creoles among its inhabitants.

DIAMOND STATE. Delaware, because of its minute size, and, consequently, its supposed extreme importance.

DOWN EAST. Maine; see DOWN EAST.

DOMINION. New Jersey. In 1817, the legislature passed an act whereby Joseph Bonaparte, ex-king of Spain and an alien, could hold real estate. Shortly after this he built a magnificent summer home at Bordentown, and spent much time there. This rather aroused the envy of sister states, who accused the Jersey people of having left the Union to be under the rule of an ex-king.

EL DORADO. California, "golden land."

EMPIRE STATE. New York.

EMPIRE STATE OF THE SOUTH. Georgia.

EXCELSIOR STATE. New York, from the motto on its coat-of-arms.

FREESTONE STATE. Connecticut, from its freestone quarries.

GARDEN OF THE METROPOLIS. New Jersey, from its innumerable fruit and market gardens.

GEM OF THE MOUNTAINS. Idaho.

GOLDEN STATE. California.

GOPHER STATE. Minnesota, from the numbers of that animal.

GRANITE STATE. New Hampshire, from its mountains of granite, said to be visible thirty miles out at sea.

GREEN MOUNTAIN STATE. Vermont, from its mountains.

GULF STATE. Florida, from its location.

HAWKEYE STATE. Iowa, from an Indian chief, Black Hawk, who lived within its territory.

HOOSIER STATE. Indiana; the word is said to have been originally *husher*, a common term in the west for a bully, and was applied by New Orleans merchants to all Indiana boatmen, on account of their rude and boisterous manners and braggadocio air. Another version of the origin is that Kentuckians gave the name to their neighbors from their peculiar way of saying "Who's yere," when they heard a knock at the door.

KEYSTONE STATE. Pennsylvania, because if the names of the thirteen original states be arranged in the form of an arch, Pennsylvania will occupy the position of the keystone of the arch.

LAKE STATE. Michigan, on account of position.

LAND OF FLOWERS. Alabama.

LAND OF STEADY HABITS. Connecticut; see BLUE LAWS.

LITTLE RHODY. Rhode Island, on account of diminutive size.

LONE STAR STATE. Texas, from the device on its coat-of-arms.

LUMBER STATE. Maine, from its immense forests.

MOTHER OF STATES. Virginia, because first settled of the thirteen original states.

MOTHER OF PRESIDENTS. Virginia, because the birthplace of six presidents.

NEW ENGLAND OF THE WEST. Minnesota, because largely settled by emigrants from New England.

NUTMEG STATE. Connecticut, because its inhabitants have the reputation of being so ingenious and shrewd, that it has been said of them, they can make nutmegs out of wood and sell them to unsuspecting purchasers.

OLD BAY STATE. Massachusetts, from the Colony of Massachusetts Bay, which was called "Old Bay" colony before the adoption of the state constitution.

OLD DOMINION. Virginia was named in early colonial history "Old Virginia" to distinguish from the New England colonies, which were frequently spoken of as "New Virginia." The state documents sent by the king to the governor were always headed to the "Colony and Dominion" of Virginia, and Old Dominion came finally to be a very common term in the papers and the conversation of the day.

OLD FRANKLIN STATE. Tennessee, in allusion to its name of Franklin from 1785 to 1788.

OLD LINE STATE. Maryland, having reference to boundary settlements between Lord Baltimore and William Penn.

OLD NORTH STATE. North Carolina.

PALMETTO STATE. South Carolina, from its coat-of-arms.

PANHANDLE STATE. West Virginia, from the irregular section of the state lying between the Ohio river and the western boundary of Pennsylvania.

PELICAN STATE. Louisiana, from its coat of-arms.

PENINSULAR STATE. Florida.

PINE TREE STATE. Maine, from its extensive forests.

PRAIRIE STATE. Kansas.

SAGE-BRUSH STATE. Nevada, from the immense growth of sage-brush on the plains.

SILVER STATE. Nevada, from the supposed wealth of its silver mines.

SUCKER STATE. Illinois, from an incident common in the days of the early emigrants. The prairies are full of holes made by the crawfish in its search for fresh water, and emigrants, in crossing these prairies, were careful to provide themselves with long hollow reeds with which to draw (suck) water from one of these holes.

SUNFLOWER STATE. Kansas, from the numbers of wild sunflowers.

TURPENTINE STATE. North Carolina.

VOLUNTEER STATE. Tennessee.

WOLVERINE STATE. Michigan.

STATE—STATE RIGHTS. The term state has a rather indefinite application in several directions; originating, however, in each instance, in the attribute of concentration, or organization; assumed possibly, in the instance of a people, for the purpose of self-preservation or defense. By a very common movement in language, the term becomes also applicable to the method or form employed for carrying out the original design. Thus a state is an organized body, made up, perhaps, of different races and different speaking peoples; having the object of union under one system of government and one general policy. And *the state*, in that instance, would be the actual system of government and policy, which ruled the body in question. Thus, Louis XIV.—"*L'état, c'est moi.*" In the case of the United States, the entrance into that condition was a transition from that of provinces, or colonies; and, therefore, more readily accomplished than it could otherwise have been. The concentration and organization were there, and it was only necessary to endow these with the functions of self-government and a systematic policy, to create a state.—The question of "state rights," is one which occurred after the confederation and on the formation of a more perfect union. Certain of these rights being withdrawn from the states and given to the general government, the actual condition of independence in their case was just so far vacated. It became a question, so far as rights still vested were concerned, whether or not these were perpetual, or if they could also be withdrawn on the application of a similar process, or in the natural order of things under the new system. As to this, the most learned expounders of constitutional law are at issue; and the point becomes, in fact, one to be decided in the case of instances as they arise, and with a due regard for national and interstate, as well as individual relations.

STATIC ELECTRICITY. See **ELECTRICITY, STATIC.**

STATICS (Gr. root *sta*, to stand), the science of the equilibrium or balancing of forces on a body or system of bodies, has gradually advanced from the days of Archimedes to the vast developments it has now acquired. Singularly enough, though most of its simpler theorems are very generally known, are almost popular, in fact, there is no science in which elementary teaching is so defective. The ordinary proofs of its fundamental principles, such as the *parallelogram of forces*, the *principle of the lever*, etc., are usually founded on the supposition that a body in equilibrium is *absolutely at rest*. Now, any one who knows that the earth rotates about its axis, that it revolves about the sun, that the sun is in motion relatively to the so-called fixed stars; that *they* are in all probability, in motion about something else which is itself in motion, etc., will at once see that there is no such thing as absolute rest, and that *relative rest* or *motion*, unchanged with reference to surrounding bodies, is all that we mean by equilibrium. He will then, at once, see that the foundations of statics are to be sought in the Laws of Motion (q.v.). And, in fact, Newton's second law of motion gives us the necessary and sufficient conditions of equilibrium of a single particle under the action of any forces; while his third law, with the annexed scholium, gives these conditions for any body or system of bodies whatever.

The simplest statement of the conditions of equilibrium of a rigid body which can be given, is that furnished by this scholium of Newton's, which is now known by the name of the principle of energy (see FORCE) or work (q.v.). It is as follows: A rigid body is in equilibrium if, and is not in equilibrium unless, in *any* small displacement whatever, no work is done on the whole by the forces to which it is subject. In the case of what are called the *mechanical powers* (q.v.), this is equivalent to the statement that work expended on a machine is wholly given back by the machine—or that the work done by the *power* is equal to the work spent in overcoming the *resistance*.

It is shown in the geometrical science of kinematics that any motion whatever of a rigid body can be reduced to *three* displacements in any three rectangular directions, together with *three* rotations about any three rectangular axes—so that the equilibrium of a rigid body is secured if no work be done on the whole in any of these *six* displacements. There are thus six conditions of equilibrium for a rigid body under the action of any forces—and these are reduced to *three* (two displacements and one rotation), if the forces are confined to one plane; and to *one* (a displacement) if the forces act all in one line.

Equilibrium may be *stable*, *unstable*, or *neutral*. It is said to be stable if the body, when slightly displaced in any way from its position of equilibrium, and left free, tends to *return* to that position. It is unstable if there is any displacement possible which will leave the body in a position in which it tends to *fall further away* from its position of equilibrium. It is neutral if the body, when displaced, is still in equilibrium. It is easily shown, but we cannot spare space for the proof, that a position of stable equilibrium is, in general, that in which the potential energy (see FORCE) of the body is a minimum—of unstable equilibrium, where it is a maximum (for some one direction of displacement at least)—of neutral equilibrium, where the potential energy remains unchanged by any small displacement. Thus a perfect sphere, of uniform material, is in neutral equilibrium on a horizontal plane—while an oblate spheroid, with its axis of rotation vertical, is in stable equilibrium; and a prolate spheroid, with its axis vertical, is in unstable equilibrium on the plane. Similar statements hold for other than rigid bodies. Thus, a chain, or a mass of fluid, is in stable equilibrium when its potential energy is least, i.e., when its center of gravity is as low as possible.

STATIONS (Lat. *statio*), a name applied in the Roman Catholic church to certain places reputed of special sanctity, which are appointed to be visited as places of prayer. The name is particularly applied in this sense to certain churches in the city of Rome, which, from an early period, have been appointed as churches which the faithful are particularly invited to visit on stated days. The names of these churches are found on the several days in the Roman missal prefixed to the liturgy peculiar to the day. The word, however, is employed in a still more remarkable manner in reference to a very popular and widely-received devotional practice of the Roman Catholic church, known as that of "the stations of the cross." This devotion prevailed in all Catholic countries; and the traveler often recognizes it even at a distance by the emblems which are employed in directing its observance—the lofty "Calvary" crowning some distant eminence, with a series of fresco-pictures or bas-reliefs arranged at intervals along the line of approach. These representations, the subjects of which are supplied by scenes from the several stages of the passion of our Lord, are called stations of the cross, and the whole series is popularly known as the *Via Calvaria*, or way of Calvary. The origin of this devotional exercise, like that of local pilgrimages, is traceable to the difficulty of access to the holy places of Palestine, consequent on the Turkish occupation of Jerusalem and the Holy Land; these representations being designed to serve as some analogous incentive to the piety and faith of the Christian worshiper of our Lord in his passion. The number of the so-called "stations" is commonly 14, although in some places 15, and in others, as Vienna, only 11; but whatever may be their number, the subject of all is a sort of pictorial narrative of the passion. The devotional exercise itself is performed by kneeling at the several stations in succession, and reciting certain prayers at each. Forms of prayer are prescribed to those who can read. The poor and ignorant recite the Lord's Prayer and Hail, Mary! all being directed to fix their thoughts in grateful memory upon "the sufferings which each representation describes our Lord as having undergone, in atonement for the sins of mankind." Many "indulgences" are granted to those who, having duly repented of their sins, shall piously perform this exercise. Many of these stations are celebrated as works of art, especially one near Bologna.

STATISTICAL CONGRESS, INTERNATIONAL. The first congress of this character was held on the suggestion of Mr. J. C. G. Kennedy, superintendent of the U. S. census, and occurred in 1853 at Brussels. To M. Adolph Quetelet, the eminent statistician, is due the successful organization of these meetings, which were successively convened at Paris, Vienna, London, Berlin, Florence, the Hague, St. Petersburg, and Buda-Pesth. Their object has been to systematize and define the statistical work of the countries represented, and the result accomplished in this direction has been valuable and suggestive.

STATISTICS, that branch of political science which has for its object the collecting and arranging of facts bearing on the condition, social, moral, and material, of a people. The word statistics was first employed in the middle of last century by prof. Achenwall of Göttingen, who may be considered the founder of the science. The principle lying at

its foundation is, that the laws which govern nature, and more especially those which govern the moral and physical condition of mankind, are constant, and are to be discovered by the investigation and comparison of phenomena extending over a very large number of instances. Accidental diversities tend to neutralize each other, their influence diminishing as the area of investigation increases; and if that area be sufficiently extended, they so nearly disappear, that we are entitled to disregard them altogether. While the length of a single life cannot be counted on, an average of 1000 or 10,000 lives gives us a constant quantity, sufficiently near the truth to answer the purposes of insurance companies. Even the acts which are the most purely voluntary as regards individual men, have been found to be subject to laws which, in respect of the masses which make up society, are invariably in like circumstances, and discoverable.

The science of statistics has a twofold relation to political and social economy. The facts collected by the statist are the bases on which political economy rests; their application to social and economical problems is an appeal from imagination to fact. But the statist must be guided by the political economist in what direction to extend his investigations: without political economy, we should have had no statistics.

It would be difficult to give any exhaustive enumeration of the multifarious topics which may be the subject of statistical inquiries. The results of statistics have been classified as—1. Problems regarding the nature of wealth and its production and growth in a community; 2. Problems relating to inland and foreign trade; 3. Problems relating to taxation and finance; 4. Problems regarding currency, banks, and prices; 5. Problems relating to the wages and hire of labor, and the division of employments; and 6. Problems relating to the functions of the state as regards interference with the economic relations of its subjects.

The statistical section added to the British association for the advancement of science in 1833, and the London statistical society founded in 1834, have made some valuable contributions to this science, and helped to diffuse a knowledge of its principles and its importance. But while in some branches there is undoubtedly room for the labors of individuals or associations, statistics are, generally speaking, more appropriately the province of the state. The most important of the subjects with which this science is cognizant, cannot be investigated without unrestricted access to government offices, and authority to demand information; and the ordinary administration of government is continually affording opportunities for the collection of the most valuable statistical facts. For some time past, statistics have largely occupied the attention of the more enlightened governments of Europe. The statistical reports issued by the various departments of the French government deserve especial praise for the comprehensiveness of their basis, and the clearness of their arrangement. The government of Belgium has, since 1841, engaged with much diligence in statistics, and Austria and Prussia have also their statistical departments. A bureau of statistics was established in connection with the treasury department of the U. S. which issues valuable bulletins.

STATIUS, PUBLIUS PAPINIUS, Roman poet, born at Naples about 61 A.D. He was educated at Rome by his father, a distinguished grammarian and preceptor of Domitian. Young Statius soon became famous for his poetic gifts, especially for his skill in extemporaneous verse, and three times gained the prize in the Alban contests. But finally, having been vanquished in the quinquennial games, he retired with his wife Claudia to his birthplace, Naples, where he died about 96 A.D. Of his works we possess only *Silvæ*, a collection of miscellaneous poems, the *Thebæis*, an epic in 12 books, and the unfinished epic *Achillæis*.

STATU'ARY AND STATUE. See SCULPTURE.

STATUTE OF LIMITATIONS. See LIMITATION.

STATUTES, or ACTS OF PARLIAMENT, are those laws made from time to time by the legislature, which qualify and alter the common law or previous statutes. All laws may be divided into common law and statutory law, the former being unwritten, the latter being written. The theory as to the common law is, that it consists merely of ancient usages, accepted by all, of which the written exposition has perished, but which tradition has kept alive; and much of the common law necessarily consists of what has sometimes been called judge-made law—a department of law which has often been ignorantly denounced as illegal or unconstitutional, but which is a necessary part of every code, under whatever name it is disguised. The legislature of Gt. Britain consists of the queen, lords, and commons in parliament assembled, and the statutes which they pass have been likened by sir Matthew Hale to written contracts or indentures, the general public being bound, by their respective agents, as if by solemn deed. There is no legal mode of altering the previously existing law, except by a statute passed with the consent of parliament; but there are other ways of modifying the law, so far as mere details of administration are concerned—as, for example, by orders in council, by ordinances, by charters, and by by-laws issued under some inherent or statutory power belonging to corporations. The mode in which a statute is made belongs properly to the head of procedure in parliament. Statutes or acts of parliament are all founded on the theory that the legislature has an inherent right to alter all previous laws or statutes: and though sometimes great and leading statutes have been declared to be unalterable by any future parliament, this restriction is obviously utterly futile, and inconsistent with the idea of a

legislature. Statutes are usually divided, according to the number of persons affected by them, into public and private—the former applying to the whole public, the latter only to the persons named or described. There is also a subdivision of both into local and personal statutes. Statutes are also divided into declaratory, penal, or remedial, according to the nature of their object. There are certain important rules as to the interpretation of statutes, the chief business of the various courts of law and equity being to construe or interpret the statutes. A statute begins to operate from the time when it receives the royal assent, unless it state some other time for its commencement; but formerly each statute was presumed to take effect from the beginning of the session of parliament in which it passed, until the rule was changed, in 1793, by the act 33 Geo. III. c. 13. The leading rule in construing statutes is, that the words are to be taken in their ordinary grammatical sense, unless the context shows that they are used in some other sense. All other rules resolve more or less into this. There is also a well-known rule that penal statutes are to be construed less strictly than other statutes of a remedial kind. Another rule is, that a subsequent statute repeals one that is prior, either expressly or by necessary implication, if the prior one is inconsistent in substance. Though it might seem an easy task to construe or interpret what is meant by a statute, it is in practice so far from being easy that it requires a special training and long experience to arrive at an accurate mode of construction, the chief business of lawyers being to acquire this art; and one excels another solely or chiefly by virtue of the tact, skill, and accuracy of thinking which are required to do such work in perfection. All the main disputes in litigation turn chiefly on the different interpretations put by parties on statutes or contracts, both of which are construed according to precisely the same rules. Another rule applicable to statutes is, that each remains in force until it is repealed, either expressly or impliedly. So much confusion, however, has arisen out of the multiplicity of statutes, and it is so difficult for lawyers to discover what statutes have been so impliedly repealed, that of late years a process of revision and examination has been instituted by the government with a view to repeal expressly all that is obsolete and that is already only impliedly repealed, so as to reduce the bulk of the statutes, which have now grown to an inconvenient size. This task is preliminary to a codification of those statutes which remain after such revision and expurgation. American statutes are passed through congress or the state legislatures in a different method from that in usage with legislative assemblies in Europe, where great pains are taken in framing statutes, and specialists and lawyers are consulted in reference to them. In the American legislature a bill may be presented by a private member, and will then be referred to the proper committee, or a committee may introduce a bill. It must then pass through three readings, of which the first two are formal. After its passage through both houses it is engrossed, signed by the presiding officer of each house, and, if it receive the signature of the presiding officers and the executive, it becomes an “act,” and is filed in the office of the secretary of state. American statutes take effect immediately, or a certain number of days after the session, or after passage.

STAUBBACH, FALL OF, a celebrated waterfall in the southern part of the canton of Bern, Switzerland, 1 m. from the village of Lauterbrunnen, and 8 m. s. of Interlaken. It is one of the loftiest in Europe, having a descent of between 800 and 900 ft., but it often disappoints visitors, who expect a swift loud-roaring cataract, and find instead a slender stream of water, concealing the face of the precipice like a “beautiful lace veil, and imitating in its center the folds of the drapery.” Long before it reaches the bottom it is blown into a dust of silver spray, whence its name *staubbach* (dust-stream). Both Byron and Wordsworth have praised it in verse.

STAUNTON, a river in s.w. Virginia, 200 m. long, rising in Montgomery co., flowing s.e. through a gorge in the Blue Ridge mountains. It separates the counties of Franklin, Pittsylvania, and Halifax from the counties of Bedford, Campbell, and Charlotte, and unites at Clarksville with the Dan river to form the Roanoke. The upper portion is sometimes called the Roanoke. In the first 20 m. it has a fall of 1000 feet.

STAUNTON, city and co. seat of Augusta co., Va.; on the Baltimore and Ohio and the Chesapeake and Ohio railroads; 136 miles w.n.w. of Richmond. It is in the beautiful Shenandoah valley; is the seat of the Western state hospital and the state institution for the deaf, dumb, and blind; and contains the Mary Baldwin seminary, Virginia female institute, Wesleyan female institute, Staunton female seminary, Staunton military academy, the Valley training school for colored pupils, Kings Daughters' hospital, and business colleges. There are electric lights and street railroads, Gipsy Hill park, national and confederate cemeteries, waterworks, with reservoir capacity of 2,500,000 gallons, national and state banks, about 20 churches, and daily, weekly, and monthly periodicals. The chief manufactures are carriages and wagons, machinery, organs, flour, cigars, sash and blinds, and ice. Pop. '90, 6975.

STAUNTON, Howard, b 1847-4; b. Engiand received; his education at Oxford, and after extended travel settled in London, and devoted himself to literature and the game of chess. He had great skill as a player, and was enthusiastic in his researches into the obscure analysis of the game. He became the editor of the *Chess-Player's Chronicle*; also edited the chess department of the *Illustrated London News*. In 1847 he published the *Chess-Player's Handbook*; in 1849 the *Companion*; in 1851 the *Chess Tournament*; and 1860, *Chess Praxis*. He also devoted much time and study to the works of Shakespeare, of which he edited an edition in 1857-60. He also wrote *Great Schools of England*, 1865.

STAUNTON, WILLIAM, D.D.; b. England, 1803; came to America, 1818; ordained in the Protestant Episcopal church, 1834; rector of St. James's church, Roxbury, Mass., 1835-40; of St. Peter's, Morristown, N. J., 1840-47; of St. Peter's, Brooklyn, 1848; rector at Potsdam, N. Y., 1852-59. He published *Dictionary of Phrases, Subjects, and Usages of the Protestant Episcopal Church*; *Book of Chants*; *Book of Common Prayer*; *Voluntaries for the Organ*, etc. He is an authority on ecclesiastical music. He d. 1889.

STAUPITZ, JOHANN VON, descended from an ancient noble family of Misnia, but the date and place of his birth are unknown; studied theology at Tübingen; became an Augustinian monk; was called by Frederick the wise, elector of Saxony, to assist in founding the university at Wittenberg; became in 1502 its dean and professor of theology; in 1503 was made vicar-general of the Augustines for the province of Germany; procured for Luther the chair of dialectics and ethics at Wittenberg; retired from Wittenberg, 1512, to Salzburg, and became court-preacher, and in 1522 abbot of a Benedictine monastery. He aided the reformation. He wrote *De Amore Dei* and *De Fide Christiana*. D. 1524.

STAVANGER, a sea-port t. of the w. coast of Norway, in the stift of Christiansand, 35 m. n.w. from the Naze, and 100 m. s. from Bergen, on the w. side of a wide and sheltered bay of the Bukken-fiord. It is a very ancient town, with a very fine old gothic cathedral, dating from the 11th century. Stavanger has cloth-manufactories and distilleries. Ship-building is carried on, and timber and fish are exported. Pop. '91, 23,930.

STAVROPOL, a government in Russian Caucasasia, bounded on the n. by the government of Astrakhan, and by the country of the Don Cossacks; by the Caspian sea on the e.; and by the Caucasus on the south. Area 23,397 sq. m.; pop. '94, 695,366. The chief rivers are the Kuban and Terek, forming the greater part of the southern boundary, and the Kuma. In the s.w., where the soil is fertile, and produces millet and wheat, agriculture is the chief employment. Immense herds of oxen and sheep are raised. Stavropol, the capital, is on the chief highway from Europe to the Caucasus, 200 m. s.e. of Rostov. It was founded in the end of the last c. Pop. '95, 44,207.

STEALING. See LARCENY.

STEAD, WILLIAM THOMAS, journalist, b. in Northumberland, England, July 5, 1849; was apprenticed to a merchant in 1863; assistant editor of the *Pall Mall Gazette*, 1880-3, when he became editor. In 1885 he was imprisoned for three months for publishing *The Maiden Tribute of Modern Babylon*. *The Review of Reviews* was founded by him in 1890. He has published *Truth about the Navy* (1884); *Truth about Russia* (1888); *The Pope and the New Era* (1889); *If Christ came to Chicago* (1893); *The Labor War in the United States* (1894); *Satan's Invisible World* (1897), etc.

STEAM. Steam is water in the gaseous form (see **HEAT**). When dry, it is invisible and transparent, like air, and is not to be confounded with *vapor*, which is steam returned to the state of water, and thus become visible—water-dust, as it were. As steam has become the most important of all motive powers, the properties on which its action depends deserve careful consideration. The development of steam is, naturally enough, connected popularly with a high temperature, but the two things do not necessarily go together. Water (or snow, or ice) gives off vapor or steam at *every* temperature—a low temperature not preventing the formation of steam, but only decreasing its density. The only limit to this evaporation is when the air surrounding the water (or snow, etc.) is already saturated with vapor of the maximum density which the water can give off at the existing temperature. Thus water at 32° Fahr. will give off vapor of a pressure equal to 0.085 lb. per sq.in.; but if the air above it is already saturated with vapor of that density, the tendency of the particles of water to fly apart is exactly balanced by the pressure of the vapor on its surface, and no more evaporation takes place. It is a remarkable fact, that while no atmospheric pressure can prevent the water or ice passing into vapor, the previous presence in the air of vapor of the required density (even when so small as in the instance just given) entirely stops it.

Let us represent a cylinder by the letter *a*, and a piston moving steam-tight within it by *p*; and suppose that the end of the cylinder above *p* is open to the atmosphere, and that below *p* there is in the cylinder a perfect vacuum. There is then a downward pressure upon the piston equal to the whole force of the atmosphere, or about 14.7 pounds per square inch. If a little water could be introduced into the bottom of the cylinder, without admitting any air, a quantity of vapor would rise from it, and press with more or less force on the lower side of the piston, so as to sustain a portion of the weight of the atmosphere. How much vapor would rise, and how much elastic force or pressure it would exert, would depend upon the temperature of the water and the cylinder.

At 32° Fahr., as we have already said, the vapor in the space *a* would exert a pressure equal only to 0.085 lb. per sq.inch. If the temperature were raised to 80°, more vapor would rise until its pressure became about 0.5 lb. per sq.in.; at 102° the pressure would be 1 lb.; at 162°, 5 lbs.; at 193°, 10 lbs.; and so on, until at 212° Fahr. the pressure would be 14.7 lbs., or exactly equal to that of the atmosphere. When this point has been reached, it is evident that the piston will be *in equilibrio*, the pressure beneath it being exactly equal to that above. At each intermediate point the downward pressure on *p* is equal to the pressure of the atmosphere, *minus* the pressure of the steam below the piston. So far as the piston is concerned, the conditions are therefore the same as if the vacuum had been impaired by the introduction of a certain

quantity of air below p ; but there is this difference between the two cases: if the space a had been occupied by rarified air, then, by forcing the piston down, and compressing it into less space, its density would increase until its pressure became equal to or greater than that of the external air. With steam, however, if the piston were depressed, and if the temperature of the steam were preserved the same, instead of its pressure being increased, a portion of it would be liquefied, and the remainder would have the same pressure as before.

It is at 212° that water in an open vessel begins to boil; that is, the vapor rises rapidly and in volumes, being able to displace the atmosphere (see *BOILING*). In this state it is usually called *steam*; but there is no essential difference between steam at 212° and steam at 60° . The steam rising from boiling water in an open vessel is of the same temperature as the water—viz., 212° ; but notwithstanding this, it contains a great deal more heat. This heat is employed in (to use popular language) forcing asunder the molecules of the steam, and thus causing it to occupy so much greater a bulk as steam than as water. It does not make itself known by the thermometer (for which reason it is called *latent heat*), but its existence and amount are known by other means, for which see the article *HEAT*.

It is important to note, before going further, that, in speaking of the pressure of steam, we have given it in pounds per sq. in. above a perfect vacuum, or in what are called *absolute pressures*. These must be carefully distinguished from pressures (as often given) in pounds *above atmospheric pressure*. According to the method we adopt, which is the more scientific one, steam of 14.7 lbs., or one atmosphere, exactly balances the pressure of the air, and can therefore do no work against it; while, if the other nomenclature had been adopted, steam of 14.7 lbs. *above* atmospheric pressure would have been really steam of *two* atmospheres pressure. In reading on this subject the student should always make sure whether the pressures spoken of are measured above an absolute zero, or only above the atmospheric pressure, as much confusion is sure to result from any mistake on this point.

When a cubic in. of water is converted into steam at the ordinary pressure of the atmosphere, its volume is increased to 1645 cubic in.—i.e., a cubic in. of water becomes nearly a cubic ft. of steam of one atmosphere. If the steam is produced at any greater pressure, its volume will be very nearly inversely as that pressure; at two atmospheres, it would occupy about 855 cubic in.; at four atmospheres, about 457 cubic inches.

When water is boiled in an open vessel, neither the temperature of the water nor that of the steam rising from it ever rises higher than 212° , however hot the fire; the heat as it enters is carried off in a latent state in the steam. But under pressure, the temperature of both can be raised to any degree. If, when the water and steam in a , fig. 1, came to 212° , the application of heat were still continued, more steam would continue to rise, and the pressure on the under side of the piston being now greater than that of the air above it, the piston would begin to ascend; but suppose it held in the same position by force, the upward pressure of the steam would be found rapidly to increase, until it would soon require a weight of 14.7 lbs. per sq. in. to keep it down, showing that the pressure of the steam was now equal to twice that of the atmosphere, or to 29.4 lbs. per sq. inch. If at this point the temperature of the water and steam were examined, it would be found to be very nearly 250° Fahr. When the absolute pressure of the steam reached 50 lbs., its temperature would be 281° ; at 100 lbs., 328° ; at 150 lbs., 360° ; and so on.

From the numerous experiments made on this subject some very important general conclusions may be drawn. Of these, one—which will be evident from the figures just given—is, that the pressure of steam increases at a far higher rate than the temperature (doubling the temperature increases the pressure *nearly 23 times*), which shows the extreme danger of continuing to apply heat to a vessel from which the steam is not allowed to escape. The bursting force would soon become such as no vessel could resist.

Another general conclusion of great importance is, that for every temperature there is a corresponding density of steam produced. This steam contains a fixed amount of latent heat, and exerts a certain uniform pressure on every side of any vessel in which it may be contained. The following table shows the relation between these values for steam of several different temperatures:

T.	p .	H.	V.	v .
32°	0.085	1091.8	3390.0	211,536
104°	1.06	1113.7	312.8	19,519
158°	4.51	1130.1	80.02	4,993
212°	14.7	1146.6	26.36	1,645
248°	28.83	1157.5	14.0	874
293°	60.4	1171.2	6.992	436
356°	145.8	1190.4	3.057	191
401°	250.8	1204.1	1.888	115

T, Temperature in degrees Fahrenheit. This corresponds to the *sensible heat* of the steam.

p , Pressure in pounds per sq. in. of the steam at that temperature.

H, Total heat of the vapor above 32° Fahr. at that temperature (according to Regnault's hypothesis) in *thermal units*. A thermal unit (.772 foot-pounds) is the quantity of heat which will raise 1 lb. of water 1° Fahr. at or near its temperature of greatest density, 39.1° Fahr. The specific heat of water increases slowly as the temperature rises, so that 1 thermal unit will not raise 1 lb. of water quite so much as 1° at high temperature; but for the purposes of this article we need not take this into account.

V, Volume in cubic ft. occupied by 1 lb. of steam.

v , Number of times which volume of steam exceeds that of same weight of water.

The relations between temperature and pressure in the foregoing table apply only so long as the steam is in contact with the water from which it is generated. Once away from the water, its temperature may be raised without altering its pressure. Steam which has received additional heat in this way is called *superheated* steam. It approximates to the condition of a perfect gas, and therefore follows nearly what is known as Boyle's or Mariotte's law (q.v.); its volume varying always inversely as its pressure. By this law, steam which occupied 1 cubic ft. at 20 lbs. absolute pressure, would occupy 4 cubic ft. at 5 lbs., and half a cubic ft. at 40 lbs. absolute pressure.

Steam, however, as commonly used in the steam-engine, is not superheated, but used under the conditions given in the table. It is then called *saturated* steam, and differs sensibly from the condition of a perfect gas. If the pressure (p) be given in pounds per sq. in., and the product ($p\upsilon$) of pressure and volume in foot-pounds, then the formula,

$$\log. (p\upsilon) = 4.675 + .061 \log. p,^*$$

gives results accurate enough at all ordinary pressures, and can be very easily applied. The volume, instead of increasing inversely as the pressure, increases less rapidly; the difference, though not very great, is large enough to be taken into account in all calculations as to the efficiency and behavior of steam in a steam-engine.

Another fact regarding the constitution of steam requires attention; from its importance in point of economy. It would naturally be expected that it would take much more heat or fuel to convert a pound of water into steam at a higher than at a lower temperature and pressure. In reality, however, the difference is very slight. Referring back to the table, it will be seen that it requires 1146.6 units of heat to raise a pound of water from 32° to 212°, and evaporate it at that temperature; of these, 180 are expended in raising the temperature, while 1146.6—180, or 966.6 units, become latent in the steam. It only requires 1171.2 units, however (261 sensible, and 910.2 latent), to raise the water to 293°, and evaporate it at that temperature; for the latent heat falls nearly as fast as the sensible heat rises. The additional heat required is thus only a little over 2 per cent, while the pressure—which is, *ceteris paribus*, a measure of the work the steam will do—is more than quadrupled. In this way, a large increase of power in any engine may be obtained by a small additional expenditure of fuel, and consequently steam of a high pressure is now being used for all purposes, its economy and advantages being fully recognized by engineers. It was thought for a long time that the *total* heat of steam—that is, the sum of the sensible and latent heats—was constant at all temperatures; but this is not strictly the case, although the table shows that the difference, for ordinary ranges of pressure, is but trifling. See HEAT and STEAM-ENGINE.

STEAM-CARRIAGE. Very early in the history of steam-locomotion, projects were formed for running steam-carriages on common roads—not to draw a train of vehicles after them, but each carriage to have passenger-accommodation as well as steam-power. Robison suggested such a thing to Watt so far back as 1759. A French inventor, Cugnot, tried a steam-carriage at Paris in 1770, which went with so much force as to dash down a brick wall, and thereby deter other inventors. In 1782, Murdoch exhibited a model of a steam carriage; in 1784, Watt described his plans for another; and in 1786 Symington produced a model of a third. In the last-named year, too, Oliver Evans announced certain projects of the kind in the United States. In 1802, Messrs. Trevethick and Vivian patented a steam-carriage, planned on a much better principle than any that had preceded it; they adopted high-pressure steam, of which previous inventors had been afraid. The carriage was tried, but the ingenious patentees received very little encouragement, and soon turned their attention to railway matters. A long interval then passed without any new inventions in this kind of road-locomotion. When Telford and other engineers had improved the roads and highways, inventors were again induced to apply steam-power as a substitute for horse-power to road-vehicles. Bramah made a steam-carriage in 1821, on a plan patented by Julius Griffiths. Gordon invented one in 1822, which worked something like a squirrel in a cage, the engine being within a cylinder which rolled along the ground; and another in 1824, which appeared to walk upon six iron legs. Goldsworthy, Gurney, Burstall, Hill, James, Hancock, Summers, Ogle, Heaton, Church, Dance, Field, Squire, Maceroni, Scott Russell, Hills, Sir James Anderson—all invented new forms of steam-carriage between 1824 and 1841. Some of these displayed great ingenuity, and attained a speed of 10 or 12 miles an hour on common turnpike roads. Sir Charles Dance ran such a carriage between Gloucester and Cheltenham in 1831, doing the 9 miles in 55 minutes; but the opposition of local interests put him down, after he had made 400 such trips without an accident, and carried a very large number of passengers. In the same year Mr. Hancock began running his steam-carriage, called *The Infant*, regularly between London and Stratford; and some time afterward, Mr. Scott Russell ran his invention between Glasgow and Paisley. All these three were passenger-vehicles which plied for traffic on the road. In the very numerous inventions from time to time brought forward, the passengers were in some cases seated in front of the engine and boiler; in others, they were seated behind; in others, the tank for water was placed beneath the passengers' feet, while in a fourth kind there was a passenger-carriage, distinct from, but linked to, the

steam-locomotive. None of the inventions, however, attained to commercial success, so many were the difficulties which beset them.

The last quarter of a century has exhibited inventions rather for heavy traction than for passenger steam-carriages. One of the most remarkable of the latter kind is that which the earl of Caithness drove, in 1864, from Inverness to his seat near Thurso. It carried three or four persons, and ascended and descended very steep inclines without much variation of speed. As a question of profit or commercial advantage the inventors of such engines now look to their employment on common roads, for dragging heavy loads. Numerous patents have been taken out, with this view, by Boydell, Bray, Clayton, Burrell, Fowler, Aveling, R. W. Thomson, and others. In Mr. Thomson's engines, or "road-steamers," the wheels are encircled by a complete ring, or tire, of india-rubber, protected on the outside by a flexible sheath of steel plates. As engines for drawing very heavy weights these have proved the most powerful yet invented, and several of them by 1874 were constantly at work in Glasgow, dragging enormously heavy castings and boilers from the workshops of the engineers to the railways or wharves. In ordinary work, however, the road-steamers can hardly be said to have been a success. The expense connected with the renewal of the india-rubber tires, and the other parts worn by the constant jolting on common roads, has told very much against their adoption. Great endeavors have been made to design an engine suitable for use upon tramway lines laid down on common roads, but as yet without complete success. The use of steam-engines has never been permitted to any extent on city railways, with the exception of the elevated railways, and as cheaper and more satisfactory motive powers are now in use, there is little or no farther effort made to apply the steam-engine to this class of work. Numerous laws have been passed to regulate the use of locomotives upon common roads. Their regulations at first were severely restrictive, framed apparently rather to discourage than to encourage mechanical traction. Now, however, that the engines are improved, and their use more understood by the public, the popular feeling against the engines, which caused this legislation, is rapidly disappearing.

It has been a favorite idea for many years with amateur and professional mechanicians (especially the former) to make a light carriage which could be used upon ordinary roads, and which should contain a steam-engine and boiler to propel itself. In spite of innumerable attempts no permanent success has yet been obtained in this direction, notwithstanding that great progress has been made in constructing steam traction engines for common roads. The fact seems to be that, while a self-propelling steam-carriage to carry only the weight of a passenger or two *can* be made without much difficulty, its cost will be proportionately so heavy, and the trouble of keeping it in order as well as of working it, so great, that it will not succeed commercially.

The true application of steam upon common roads is in the drawing of heavy loads which would otherwise require an inconveniently large number of horses. Engines for this purpose are called *traction-engines*, and their use, notwithstanding determined, and too often ignorant opposition, seems to be yearly on the increase. Traction-engines may be divided into two classes—those with rigid tires on their wheels, and those with flexible tires. The former class is the older, and includes many ingenious but mistaken contrivances for laying down what was equivalent to an endless railway for the engine to run upon, which was at one time thought by many essential to its success. The best engines at present made with rigid tires are those of Messrs. Aveling and Porter of Rochester, which are simple and substantial in construction, and are used largely both in this country and abroad. Of the second class of traction engines those fitted with Thomson's patent india-rubber tires, and by the inventor called *road-steamers*, are the only ones that have come into anything like extended use. These tires are simply rings of india-rubber, 4 or 5 in. thick, stretched over the rim of the wheel, and protected by a flexible circle of steel shoes from being damaged by stones, etc. The advantage of flexible tires is the greater adhesion (in proportion to weight) which they give to the engine, and the saving the machinery from shocks and jars. They will doubtless be still more largely used when more lengthened experience has perfected their construction, but their great cost has hitherto much hindered their extended adoption.

STEAM-CRANE. The application of steam to the working of cranes was an obvious one, and is now universal where much hoisting work has to be done; it not only effects a great saving in labor, but causes the work to be much more quickly done, a consideration quite as important. Steam-cranes and winches are now almost invariably used on board all large steamboats, both for loading and unloading, heaving the anchor, warping the ship along by means of a cable, and other purposes. When working on a wharf, and in many other situations, it is often very convenient that the crane should be movable, so that it may go to its work in the multitude of cases where that arrangement is more convenient than the converse. For this purpose it is mounted on a plain railway truck, either of wood or iron, the truck being generally provided with clamps at the ends, by which it can be firmly secured to the rails when lifting weights. The balance construction, now universally adopted for portable cranes, was invented or suggested by the late Mr. R. W. Thomson, C.E., in 1856—its essential feature being the use of the boiler as a counterpoise to the weight to be lifted. The principal parts of a steam-crane

are: 1. The boiler, which must be of some very simple construction, as it has so frequently to be worked with excessively dirty water; 2. The framing, which is generally made of cast-iron, and supports the boiler, the engine and gear, and the jib; 3. The engine (which has almost always two small cylinders, and is fitted with reversing gear), and the pinions, wheels, drums, etc., for the hoisting and other motions; 4. The "jib" (either of wood or iron), over a pulley in the top of which the chain passes, and the purpose of which is to enable the different objects to be lifted quite clear of the ground, and deposited, when necessary, on trucks, etc.; 5. The pillar, which is firmly attached to the truck, and which, passing upward through the center of the frame, forms the pivot on which it turns round; 6. The truck itself, which supports the whole machine. If the crane is stationary, the truck, of course, is not required, the bottom of the pillar being imbedded in masonry; and for large cranes the boiler is generally made separate from the machine itself, and sometimes the engines also. A portable balance steam-crane is, when complete, fitted with the following motions: 1. Gear for hoisting, generally with two or more speeds, to be used according to the weight to be lifted; 2. Gear for raising or lowering the outer end of the jib; 3. Gear for slewing the jib (with boiler and frame attached to it); 4. Gear for propelling the truck along the rails. Steam-cranes, with forked malleable iron jibs, have been erected in recent years, which will lift a weight of 50 or 60 tons. See *illus., PULLEY, ETC.*, vol. XII.

STEAM-ENGINE. Steam-engines, in their infancy, were known as "fire" (that is, *heat*) engines; and in point of fact the older term is the more correct, because the water or steam is only used as a convenient medium through which the form of energy which we call heat is made to perform the required mechanical operations. In modern engines sufficient heat is added to the steam to raise it to a very high pressure, and the excess of this pressure over the pressure opposed to it (either atmospheric pressure or the still lower pressure in a condenser) is both the cause and measure of the work done by the engine. In earlier machines, however, the steam was raised only to atmospheric pressure, and admitted into the engine only to be at once condensed by a jet of cold water. The excess of the atmospheric pressure above the pressure in the partial vacuum caused by the condensation was then the direct cause of work. Engines of this kind are not now used; they were called *atmospheric* engines. As a source of power steam has many advantages over wind and water. It is independent of the weather, may be applied anywhere, affords a constant equable motion, and is capable of indefinite increase. Its invention, therefore, has caused a new era in the arts; and the revolution which it has brought about in industry of all kinds, as well as the influence it has had on civilization in general, and must yet have in a higher degree, are altogether incalculable.

The invention of steam as a moving power is claimed by various nations; but the first extensive employment of it, and most of the improvements made upon the steam-engine, the world indisputably owes to the English and the Americans. It would appear that as early as 1543 a Spanish captain, named Blasco de Garay, showed in the harbor of Barcelona a steamboat of his own invention. It is most likely that Blasco's engine was on the principle of the *Æolipile* of Hero, invented 130 B.C., in which steam produces rotatory motion by issuing from orifices, as water does in Barker's mill (q.v.). The preacher Mathesius, in his sermon to miners (Nuremberg, 1562), prays for a man who "raises water by fire and air," showing the early application of steam-power in Germany; and the German engineer, Sol. de Caus, in the service of the elector palatine in Heidelberg, describes, in his work, *Les Raisons des Forces Mouevantes avec Diverses Machines* (Frankf. 1615), a steam-machine, which was merely a contrivance for forcing the water contained in a copper ball through a tube by applying heat. An Italian engineer, G. Branca, invented, in 1629, a sort of steam windmill; the steam being generated in a boiler, was directed by a spout against the flat vanes of a wheel, which was thus set in motion.

In England, among the first notices we have of the idea of employing steam as a propelling force, is that contained in a small volume,* published in 1647, entitled *The Art of Gunnery*, by Nat. Nye, mathematician; in which he proposes to "charge a piece of ordnance without gunpowder," by putting water instead of powder, ramming down an air-tight plug of wood, and then the shot, and applying a fire to the breech "till it burst out suddenly." But the first successful effort was that of the marquis of Worcester. In his *Century of Inventions*, the manuscript of which dates from 1655, he describes a steam-apparatus by which he raised a column of water to the height of 40 feet. This, under the name of "fire-waterwork," appears actually to have been at work at Vauxhall in 1656. Sir Samuel Morland in 1683 submitted to Louis XIV. a project for raising water by means of steam, accompanying it with ingenious calculations and tables. The first patent for the application of steam-power to various kinds of machines was taken out in 1698 by capt. Savery. In 1699 he exhibited before the Royal society a working model of his invention. His engines were the first used to any extent in industrial operations; they seem to have been employed for some years in the drainage of mines in Cornwall and Devonshire. The essential improvement in them over the older ones was the use of a boiler separate from the vessel in which the steam did its work. One vessel, in all

* The volume is in the possession of Mr. S. Holliday, to whom we are indebted for this fact.

former engines, had served both purposes. He made use of the condensation of steam in a close vessel to produce a vacuum, and thus raise the water to a certain height, after which the elasticity of steam pressing upon its surface was made to raise it still further in a second vessel.

In all the attempts at pumping-engines hitherto made, including Savery's, the steam acted directly upon the water to be moved without any intervening part. To Dr. Papin, a celebrated Frenchman, is due the idea of the *piston*. It was first used by him in a model constructed in 1690, where the cylinder was still made to do duty also as a boiler; but in an improved steam-pump invented about 1700 he used it as a diaphragm floating on the top of the water in a separate vessel, or cylinder, and the steam, by pressing on the top of it, forced the water out of the cylinder at the other end.

The next great step in advance was made about 1705 in the "atmospheric" engine, conjointly invented by Newcomen, Cawley, and Savery. This machine held its own for nearly seventy years, and was very largely applied to mines, so that it will be worth while to give a somewhat more detailed description of it than of the others.

In this engine, which is shown in fig. 1, the previous inventions of the separate boiler, and of the cylinder with its movable steam-tight piston, are utilized, although in a new form. The "beam," which has ever since been used in pumping-engines, was used for the first time, and for the first time also the condensation of the steam was made an instantaneous process, instead of a slow and gradual one. Newcomen's engine was chiefly used, like all former steam-engines, in raising water. To one end of a beam moving on an axis I, was attached the rod, N, of the pump to be worked; to the other, the rod, M, of a piston P, moving in a cylinder C, below. The cylinder was placed over a boiler B, and was connected with it by a pipe provided with a stop-cock V, to cut off or admit the steam. Suppose the pump-rod depressed, and the piston raised to the top of the cylinder—which was effected by weights suspended at the pump-end of the beam—the steam-cock was then turned to cut off the steam, and a dash of cold water was thrown into the cylinder by turning a cock R, on a water pipe A, connected with a cistern C'. This condensed the steam in the cylinder, and caused a vacuum below the piston, which was then forced down by the pressure of the atmosphere, bringing with it the end of the beam to which it was attached, and raising the other along with the pump-rod. The cock was then turned to admit fresh steam below the piston, which was raised by the counterpoise; and thus the motion began anew. The opening and shutting of the cocks was at first performed by an

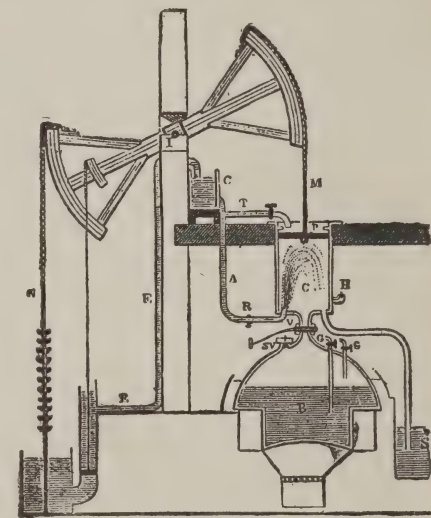
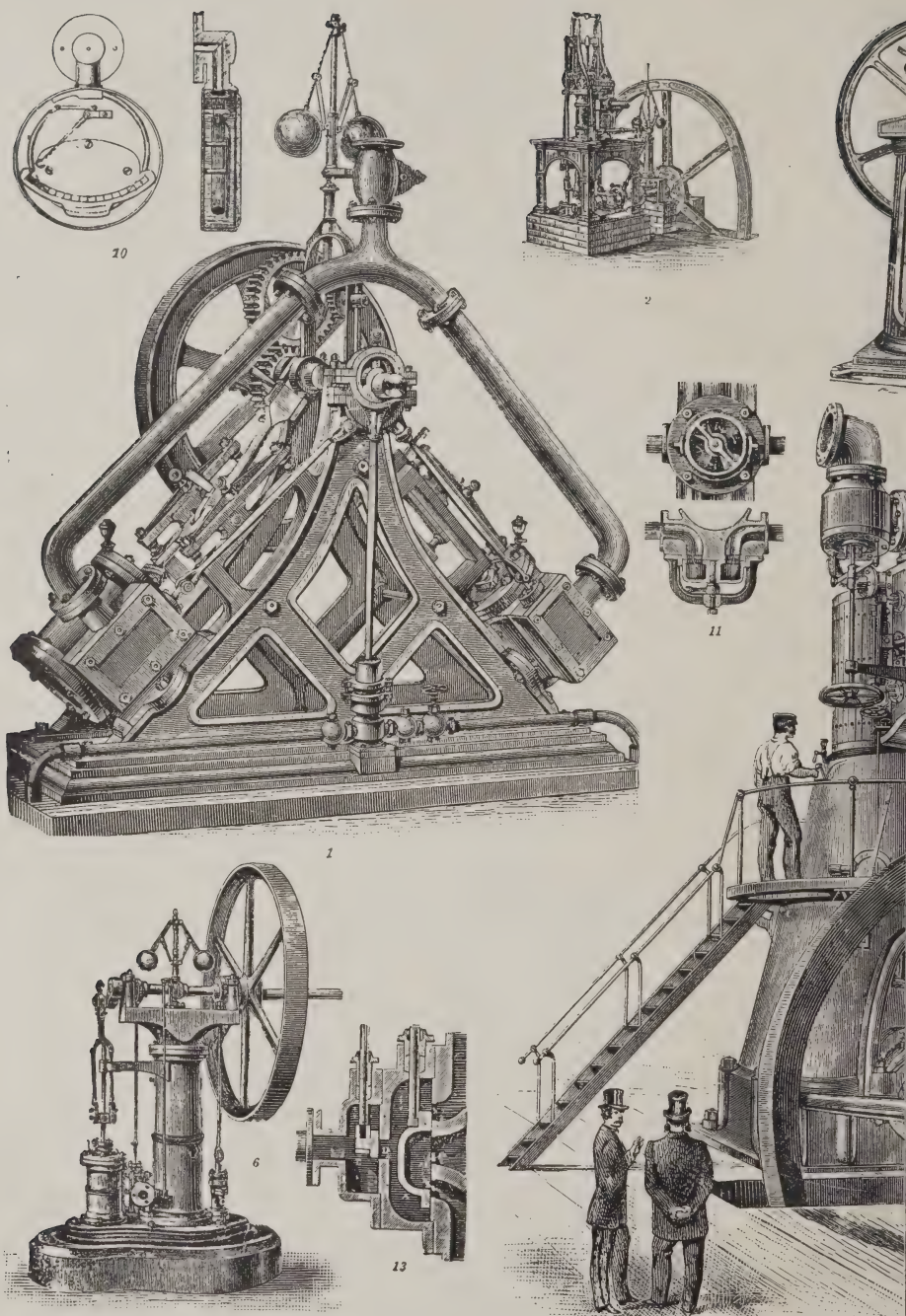


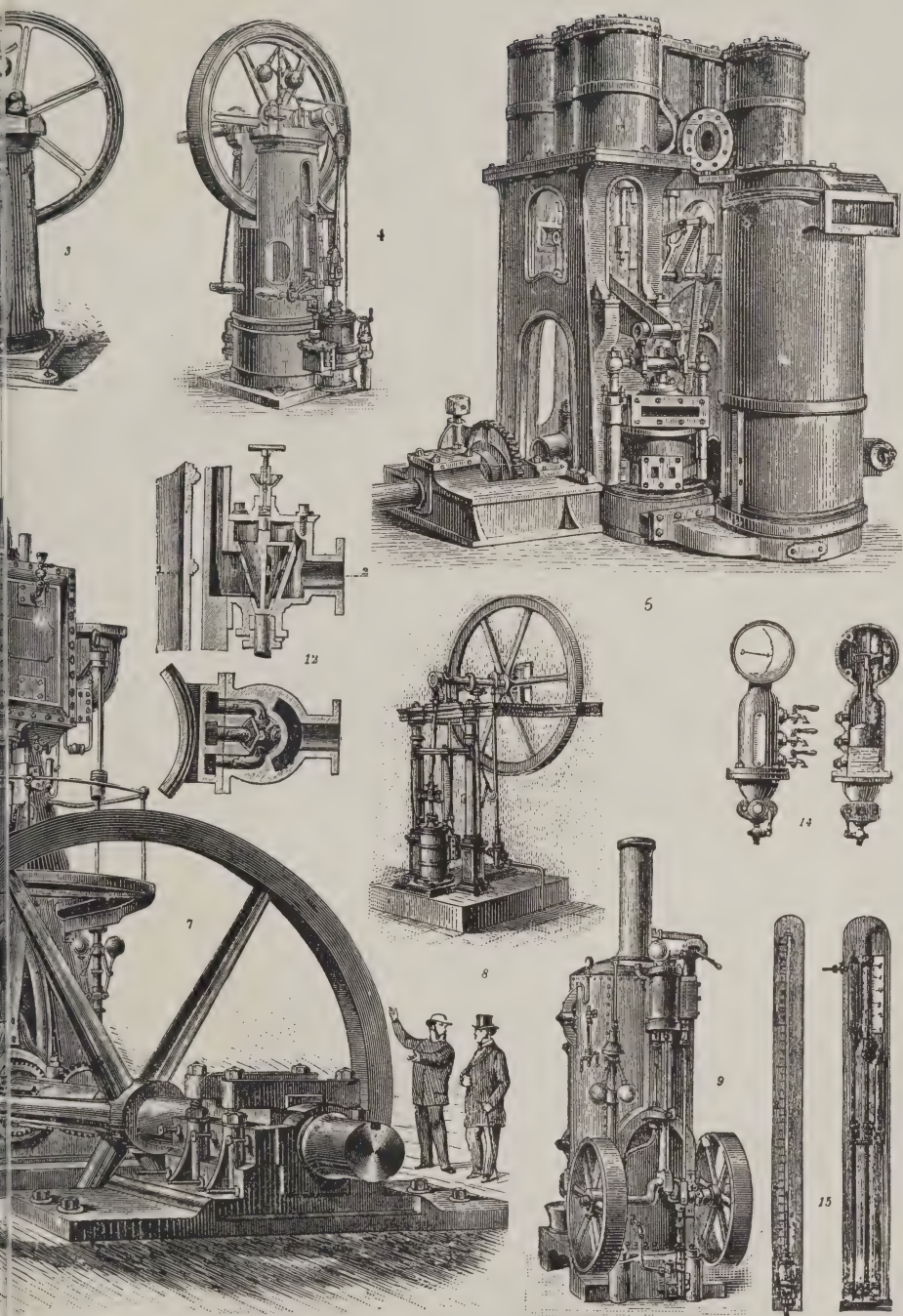
FIG. 1.

attendant, but subsequently a boy named Humphrey Potter (to save, it is said, the trouble of personal superintendence) devised a system of strings and levers by which the engine was made to work its own valves. In 1717 Henry Beighton, an F.R.S., invented a simpler and more scientific system of "hand-gear," which rendered the engine completely *self-acting*. During the latter part of the time that elapsed before Watt's discoveries changed everything, Smeaton brought Newcomen's engine to a very high degree of perfection. As the result of study and experiment he made many improvements in it, in the form of the boiler, the proportions of the cylinder, etc. It was he, too, who invented the *cataract*, a very ingenious self-acting valve arrangement, which is still universally used in Cornish engines. It is worth mentioning that, in 1725, Leupold invented an engine in which steam of a higher pressure than that of the atmosphere was employed in the cylinder, but his engine possessed defects that prevented its practical use.

The next essential improvements on the steam-engine were those of Watt, which began a new era in the history of steam-power. The first and most important improvement made by Watt was the separate condenser, patented in 1769. He had observed that the jet of cold water thrown into the cylinder to condense the steam, necessarily reduced the temperature of the cylinder so much that a great deal of the steam flowing in at each upward stroke of the piston was condensed before the cylinder got back the heat abstracted from it by the spurt of cold water used for condensing the steam in the cylinder. The loss of steam arising from this was so great that only about one-fourth of what was admitted into the cylinder was actually available as motive-power. Watt, therefore, provided a separate vessel in which to condense the steam, and which could



STEAM-ENGINES. —1. Diagonal steam-engine. 2 to 4 and 6 to 8. Vertical steam-engines of various sizes. 5. Combined or compound steam-engine with three cylinders. 9. Steam-engine and its accessories for the distribution of steam. 14. Water-gauge for boiler.



Various constructions, showing the arrangement of the cylinder, fly-wheel, and supports. 10, 15. Manometers to measure steam pressure in boiler. 11 to 13. Apparatus

be kept constantly in a state of vacuum, without the loss which arose when the cylinder itself was used as a condenser. This device, which now looks simple enough, was the greatest of Watt's inventions, and forms the foundation of his fame. His genius was such that in a few years he changed the steam-engine from a clumsy, wasteful, almost impracticable machine into a machine practically the same as we now have. The principal improvements since his time have been either in matters relating to the boiler; in details of construction consequent on our increased facilities, improved machinery, and greater knowledge of the strength of materials; in the enlarged application of his principle of expansive working; or in the application of the steam-engine to the propulsion of carriages and vessels. His principal inventions were: 1. The condensation of steam in a vessel separate from the cylinder, so as to avoid the cooling of the latter; 2. The use of a pump, called an "air-pump," to withdraw the condensed water, and mixed steam and air, from the condenser; 3. To surround the cylinder either with a steam-jacket or with some non-conducting body, in order to prevent radiation of heat (these three, with others, were included in the specification of 1769); 4. To use the steam expansively in the way explained further on in this article (this was invented before 1769, but not published till 1782); and 5. The now universally used double-acting engine, and the conversion of the reciprocating motion of the beam into a rotary motion by means of a crank (both these were invented before 1778, the engine being patented in 1782, but the crank having before that date been pirated and patented by another). In 1784 Watt also patented and published his parallel motion, throttle-valve, governor, and indicator; all four of which are in substance still used.

It would be inconsistent with our limits to enter into any description of the constructive details of steam-engines; we can only afford to give a general notion of the way in which the motion is originated, and to explain the chief principles on which the motive-power and economy of engines depend. We shall consider the latter first, and may say that the article STEAM should be read as an introduction to what follows, as we must assume a familiarity with the statements there made.

The common mode of employing steam in an engine is by causing it to press alternately on the two surfaces of

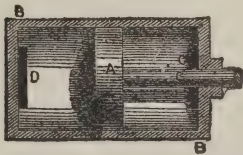


Fig. 2.

a movable diaphragm or piston inclosed in a fixed, steam-tight, cylindrical box. In fig. 2, A is the piston, and B a section of the box. The piston, by means of a rod E, passing through the end of the box, is made to communicate motion to the rest of the machinery. The steam is first admitted to one end of the cylinder through an opening D, and forces the piston along to the other end. The current of steam from the boiler is then allowed to pass into the other end of the cylinder through the opening C, and forces the piston back again to its original position, and so on. But it is obvious that while this return-motion is going on, the steam previously admitted at D

must be allowed some exit, or the piston could not be forced back. The manner of this exit constitutes the difference between the two principal classes of engines, according as the steam is allowed simply to rush out into the atmosphere, or is conducted into a separate vessel, and there "condensed."

The simplest way in which steam can be used in a cylinder is at the same time the most wasteful. It consists in filling each end of the cylinder alternately full of steam direct from the boiler, and having the full boiler pressure, and thus forcing the piston along in exactly the same way as that in which it would have to be forced were water the fluid used instead of steam. We have said this is wasteful; let us examine the reasons. If we imagine the cylinder to have a capacity of 7 cubic ft., then, if it be filled entirely with steam from the boiler at 60 lbs. pressure, it will contain just one pound-weight of steam.* The total heat in this pound of steam, as given in the table, is equivalent to 1171 thermal units.† When the piston has reached the end of its stroke, the steam contained in the cylinder is thus in itself a great storehouse of work, for each of these thermal units is equivalent to 772 "foot-pounds" of mechanical energy. But instead of utilizing this force, at the moment when the cylinder is full of steam the one opening is put into communication with the boiler, the other opening with the atmosphere, and the steam immediately rushes out of the cylinder, and dissipates its contained energy through the air.

It must be remembered that although the steam, when allowed to go into the atmosphere, is immediately reduced to the pressure corresponding to the temperature of the air (which in ordinary cases would be only a fraction of a pound per square inch), still the full pressure of the atmosphere itself will always be acting on the back of the piston during its stroke; and that therefore, to find the force with which the piston is being pushed along, we must subtract that pressure from the steam-pressure. On the one side of the piston will be the atmosphere with its uniform pressure of nearly 15 lbs. per square

* These figures are near approximations only, as will be seen from the table in article STEAM.

† A "thermal unit" is the quantity of heat necessary to raise, through 1° Fahr., the temperature of a pound of water at its temperature of max. density—viz., 39.1° Fahr., and may be considered, without much error, as the quantity of heat necessary to raise a pound of water 1° Fahr., at any place on the thermometric scale.

inch, and on the other side the steam pressure of 60 pounds. The effective pressure thus will be 60—15, or 45 lbs. per square inch only.

Let us now consider the somewhat more economical case of an engine in which the steam is first used as described above, but afterward, instead of being allowed to pass into the atmosphere, is conducted through a pipe into a closed vessel, and there condensed. The process commonly called condensation, and associated with the idea of liquefaction, consists in essence merely of the subtraction from steam of a portion of its sensible heat. This reduction of temperature has a double effect on the steam—first, the liquefaction of a part of it; and then, the reduction of the rest to the pressure corresponding to the reduced temperature. (It will be remembered that steam exists at *all* temperatures.) It is not possible to do one of these things without the other, and this fact lies at the bottom of a correct conception of what is called by engineers a “vacuum.” What is commonly called “vacuum” simply means pressure less than the atmospheric pressure; and, in the case of steam-engines, a vacuum generally implies a pressure of between 2 and 4 lbs. per square inch—that is, from a seventh to a fourth of the ordinary pressure of the air. The most common way of condensing steam is by bringing it into contact either with a jet of cold water, or with surfaces kept continually cool by a current of water. In either case, directly the steam is brought into contact with the water, or cooling surface, it transfers to it the larger portion of its sensible heat. During this process, the greater part of the steam is liquefied, and the remainder retains only such a pressure as corresponds to its greatly reduced temperature.

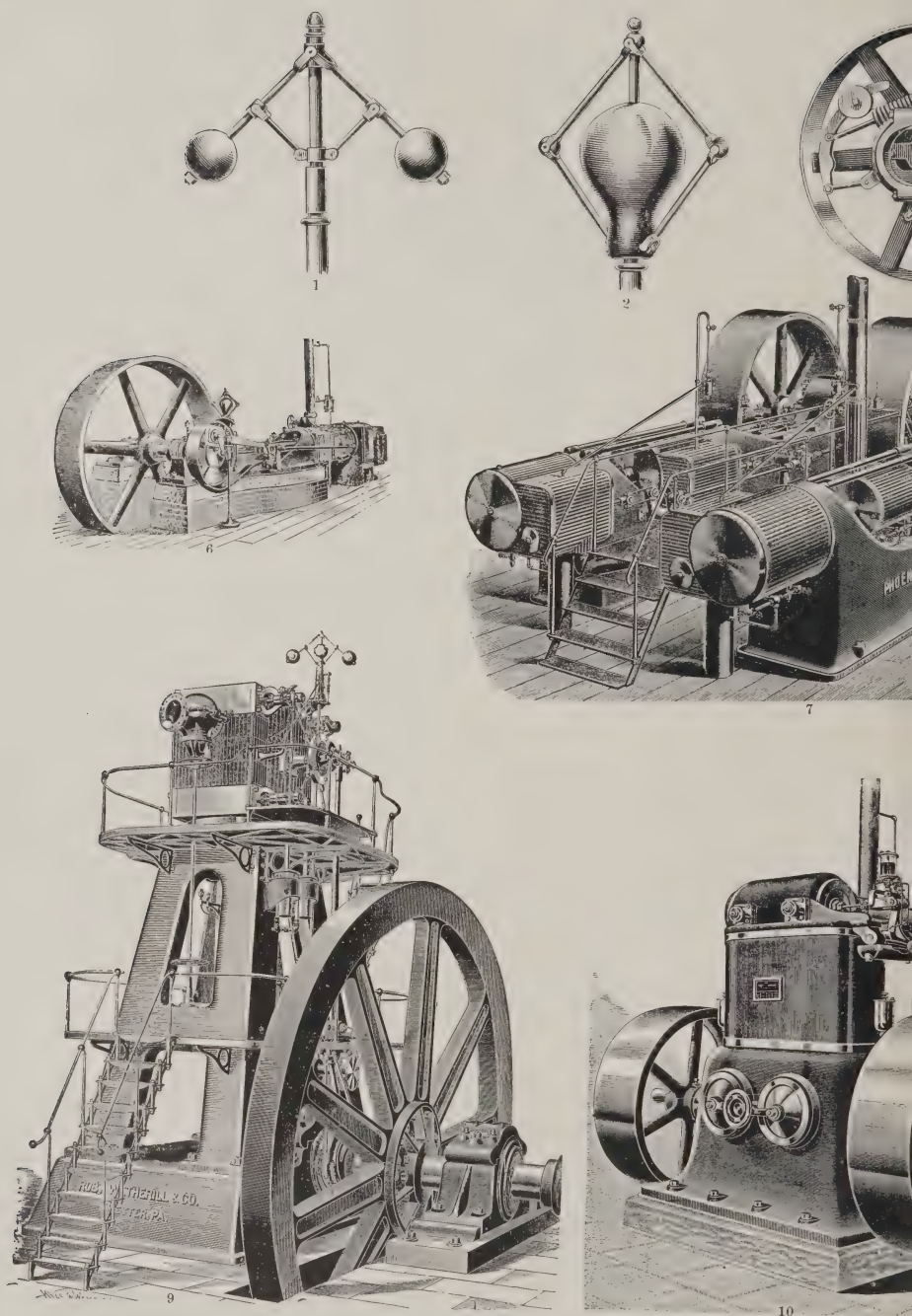
The advantages possessed by a condensing over a non-condensing engine will now be obvious. When the piston is being forced from one end of the cylinder by steam entering through the other, the force on the back of the piston resisting its motion in that direction, instead of being equal to the pressure of the atmosphere, is only the pressure of the steam in the condenser, or about 1 lb. per square inch. The net effective force is therefore 60—1, or 59 lbs., instead of 60—15, or 45 pounds. In actual practice these figures would be modified, because, from various causes, such a low back pressure as 1 or 15 lbs. above zero (in condensing and non-condensing engines respectively) is never obtained, but the principle remains the same.

We have supposed that our cylinder, when full of steam, contained just 1 pound-weight at 60 lbs. pressure. Let us now find out how much useful work this pound of steam has done for us, and we will then show how the same weight may be made to do a great deal more, by utilizing more of its great store of heat. Let us suppose that the area of the cylinder is 2 sq. ft., while its length (the stroke of the piston) is $3\frac{1}{2}$ feet. It will thus have a capacity of 7 cubic ft., as before assumed. In the first case described, we should have a pressure of 45 lbs. per square inch exerted on an area of 288 sq. in., through a distance of $3\frac{1}{2}$ feet. This is equal to 45,360 foot-pounds of work. In the second case, we have a pressure of 59 lbs. per square inch on the same area, and through the same distance. This is equal to 59,472 foot-pounds of work, or about $\frac{1}{5}$ of the total heat supplied by the fuel.* We may now proceed to examine the way in which the same weight of steam, generated by the consumption of an identical weight of fuel, may be made to perform many times more work by “working expansively.”

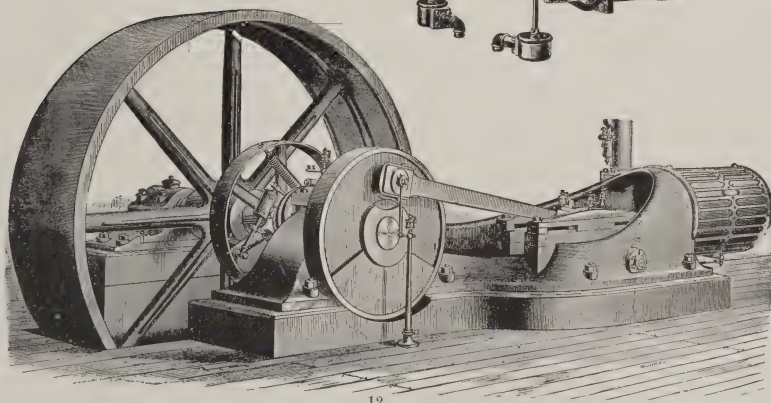
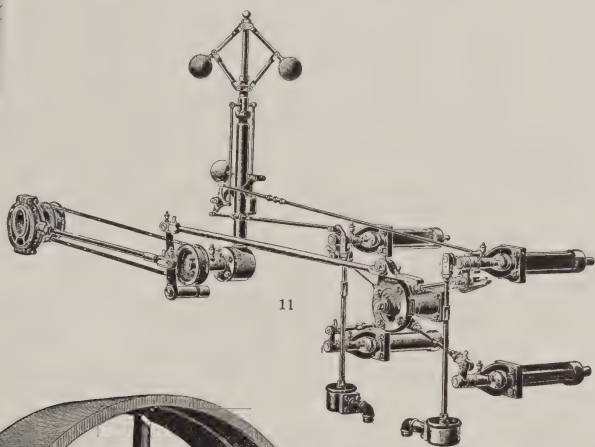
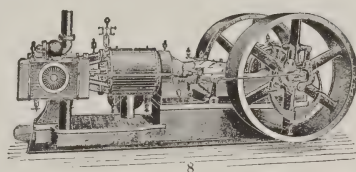
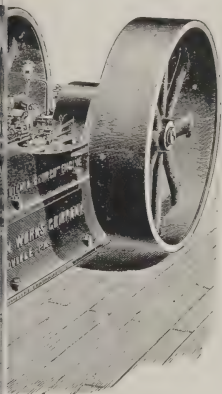
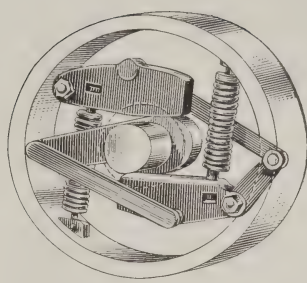
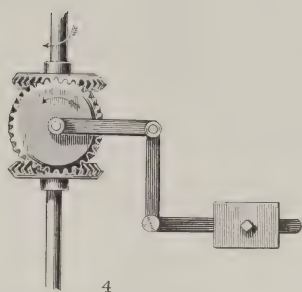
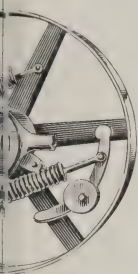
One of the properties possessed by steam, in common with all other gases, is a tendency to expand indefinitely. In article STEAM we mentioned and illustrated the fact that its pressure varied nearly inversely as its volume. For simplicity's sake we shall here assume that steam is a perfect gas, and follows Boyle's law, the pressure varying *exactly* inversely as the volume. We shall now describe the way in which this expansibility of steam is taken advantage of by the engineer. If we have a cylinder of the same area as before, but of twice the length, but only intend to admit 1 lb. of steam into it at a time, it will be necessary, when the piston has traveled $3\frac{1}{2}$ ft. of its stroke, to shut the entrance valve, so as to prevent more steam entering; this is called “cutting off” the steam. The piston, however, still continues its motion in the same direction as before, propelled by the internal separative energy among the particles of steam. But as it is pressed forward, the space occupied by the steam is always increasing, and its pressure always decreasing in proportion, until at length, when the piston has reached the end of its stroke, the steam occupies exactly double its original volume—viz., 14 cubic ft., and is reduced in pressure to half its original pressure—viz., to 30 lbs. per square inch. We have thus, during the first half of the stroke, a constant pressure on the piston of 60 lbs. per square inch, and during the second half a pressure gradually decreasing from 60 to 30 pounds. The *mean* pressure during this second half of the stroke will be found on calculation to be almost exactly 40 pounds. Let us now, in the same way as before, see what work we have been able to get out of our pound of steam by expanding it in this way. In the first half of the stroke we have 59,472 foot-pounds of work exactly as before, and then we have in addition a mean pressure of 40—1, or 39 lbs. per square inch, exerted over 288 sq. in. for a distance of $3\frac{1}{2}$ feet. This equals 39,312 foot-pounds, making a total of 98,784 foot-pounds of work obtained from the steam which only gave us 59,472 before. The economy of working expansively, how-

* For simplicity's sake, we have here assumed that the water in the boiler has to be raised from 33° to 292°, and evaporated at that temperature. If the water were supplied at 212°, then the work done would be about $\frac{1}{15}$ instead of $\frac{1}{5}$ of the total heat.

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STEAM ENGINES (MODERN).—1-5. Types of steam engine governors. 6. Porter-Allen automatic engine. 8. Belmont automatic cut-off compound engine. 9. Wetherill vertical compound Corliss valve gear. 12. Buckeye simple automatic engine.



high speed compound engine. 7. Dick & Church's four-cylinder triple-expansion Corliss engine. 10. Westinghouse vertical automatic compound engine. 11. Parts of

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ever, goes much further than this. If the cylinder had been four times its original length, and the steam had been cut off at the same point as before (which would then be quarter instead of half stroke), we should have obtained from the 1 lb. of steam 144,345 foot-pounds of work. If we had gone still further, and expanded the pound of steam into eight times its original volume, we should have obtained no less than 179,984 foot-pounds of work, which is more than three times as much as at first.* All modern engines are worked more or less on this principle of expansion, and the general tendency seems to be every year to adopt higher initial pressures, and larger ratios of expansion.

Having thus briefly sketched the history of the steam-engine, and the theory of its action, we may now proceed to some consideration of its mechanism. Fig. 3 represents Watt's "double-acting" condensing engine, which we have already mentioned. By "double-acting engine" we mean an engine such as was sketched in fig. 2, in which the steam acts on both sides of the piston instead of only on one, as in Newcomen's engine. Watt's engine, though not of the form now generally used, contains all the parts now considered essential; and we may therefore describe it before saying anything about these parts in detail. The steam from the boiler passes direct to the valve-chest *v*, which is simply a long box attached to the cylinder *a*. In this chest are placed valves, which

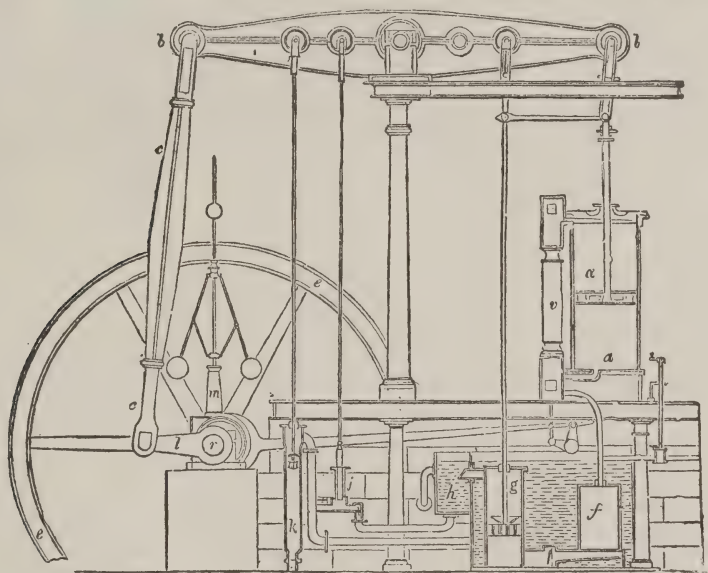


FIG. 3.

are so regulated as to open communication between the boiler, cylinder, and condenser, in such a way that when the top of the cylinder is open to the boiler, the bottom communicates with the condenser, and *vice versa*. When the steam has done its work, it passes out through the bent pipe into the condenser *f*, where it is met by a jet of water (not shown in the engraving), and condensed, as before explained. *g* is a pump called the air-pump, which continually draws away the contents of the condenser, and discharges them into a cistern *h*, called the hot-well. A small force-pump, *j*, draws part of the water from this cistern, and sends it back again to the boiler, there to be reconverted into steam, while the rest of the water is allowed to run to waste. A suction-pump *k*, supplies water to the large tank round the condenser, and also for the condensing jet. Inside the cylinder are the piston and the rod (called the piston-rod) connecting it with the beam *bb*. In Newcomen's engine, the rod had only to pull the beam down and not to push it up; it could, therefore, be connected to it by a chain, as shown in fig. 1. In the double-acting engine, the piston-rod is required both to pull and to push the beam, so that the chain is no longer admissible. It is obvious that as the head of the rod must move in a straight line, while every point in the beam describes an arc of a circle, the two cannot be rigidly connected. Watt invented the arrangement of rods shown in fig. 3, by which the piston-rod head is always guided in a straight line, while the end of the beam is left free to pursue its own course. This is called a "parallel motion."

* In actual working, owing to various causes—such as imperfect action of the valves, radiation from the cylinder, bad vacuum, etc.—the work obtained from the steam is not more than .65 to .75 of that given in this paragraph.

The end of the beam furthest from the cylinder is connected by a rod *cc*, called a connecting-rod, to the crank *l*, which is firmly fixed on the shaft; and by this means the reciprocating motion of the beam is converted into the rotary motion of the "crank-shaft" *r*. The governor *m*, and the fly-wheel *ee*, will be explained further on.

The cylinder and its piston are both made of cast-iron. The former is very accurately bored in a lathe, and ought always to be covered outside with non-conducting material to prevent radiation of heat. It is frequently inclosed in another cylinder, and the annular space, or "jacket" between them filled with steam from the boiler, principally with the object of preventing liquefaction in the cylinder, which is fatal to economical working. The openings for the entrance or discharge of the steam are called *ports*.

The valve or valves which regulate the admission of steam to the cylinder vary very much in construction and design. In ordinary engines one valve, called a *slide-valve*, does the whole work for each cylinder in a way which we shall explain by the aid of fig. 4. This figure shows the valve in two positions—namely, those corresponding to the times when the piston is at the middle of its stroke, going in the two different directions—*c* and *d* are the ports; *b* is the "exhaust port," or opening through which the steam passes to the condenser; and *a* is the slide-valve working inside the steam-chest (not shown). The sketch to the left shows the position of the valve when the piston is moving upward. The steam enters the cylinder through *d*, as shown by the arrows, while the steam in the other end is free to rush out by *c*, under the valve, and through *b* into the condenser. By the time the piston has reached the same position, going in the opposite direction, the valve is in the position shown in the right-hand sketch, and the motion of the steam is exactly reversed. When it is desired to "cut off" the steam earlier than half-stroke, a separate valve, called an *expansion valve* (of which there are innumerable varieties) is generally used. The rod to which the piston is attached is called the *piston-rod*, and the rod which actually drives the crank the *connecting-rod*. In Watt's engine, and similar machines, these are connected to opposite ends of a *beam*, but in the common type of engine the two rods are directly attached.

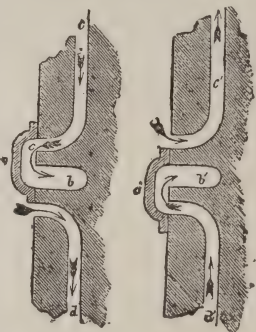


FIG. 4.

The *fly-wheel* is a large wheel fixed on the crank shaft, and having a very heavy rim. As it revolves, this contains, *stored up* in itself, a great quantity of energy, and so equalizes the motion of the shaft, and, by *restoring* some of the energy, enables the engine to pass the "dead-points," or points at which the connecting-rod and crank are in a line.

The *condenser* is simply a cast-iron box of any convenient shape. The water for condensing the steam is introduced into it in a jet, or surrounds coiled pipes, through which the steam passes, so as to condense it almost instantaneously.

The *governor* is an ingenious application by Watt of mechanism long used in water-mills. Its object is to make the engine to a great extent regulate its own speed, so that it shall neither be pulled up altogether by a sudden increase of load, nor "race" when any part of its load is suddenly removed. It consists essentially of a spindle or upright rod, with a pulley, by which it is caused to revolve, fixed on it. Two levers are pivoted on a pin near the top of the spindle, and at the lower end of each is fixed a heavy cast-iron ball. When the engine is running at its proper speed, the balls revolve with the spindle in the position shown; but if that speed be increased, the centrifugal force causes them to fly outward, and consequently upward; and conversely, if it be decreased, they fall downward toward the center. At the upper end of the spindle is a system of levers, by which the raising of the balls tends to close, and their lowering to open, the *throttle valve*. This valve is simply a disk of metal placed in the steam-pipe near the cylinder. The further, therefore, it is opened, the greater the amount of steam admitted to the cylinder, and *vice versa*, and so the tendency of the engine to alter its speed arising from causes extraneous to itself, is just balanced by the alteration made in the amount of steam admitted through the throttle-valve. In order that economy as well as regularity of working may be attained, the governor should, however, be so arranged as to control the "cut-off" instead of throttling the steam.

The "Cornish" engine, so called from the fact that it is principally used in the Cornish mines, resembles Watt's engine in general appearance. Like Newcomen's engine, it is used exclusively for pumping, and has no rotary motion, and it is virtually single-acting; but unlike his, the steam pressure, and not that of the atmosphere, actually does the work. It is not easy to say why Cornish engines have remained so long in their original form. They are economical of fuel, owing to the great expansion used, but the same expansion could also be used with many other forms of engine. They are very costly, and extremely heavy and unwieldy, and it seems probable that it is only prejudice which stands in the way of their being superseded by small engines running at high speeds, which would do the same work as economically, and with a much smaller outlay in first cost.

Engines in which the piston-rod and connecting-rod are directly attached are called

direct-acting engines, of which the horizontal engine is the most common type, and for all ordinary purposes is rapidly superseding every other form of stationary engine. It possesses the merits of having great simplicity and few working parts, and of all these parts being easily accessible to the engine-driver; and at the same time any required degree of economical working can be obtained in it as well as in any other form. It was for a long time only used non-condensing, but is made so that it can be used with a condenser or not as desired.

Two other forms of direct-acting engines have been much used in their day, but are now being rapidly abandoned except under special circumstances; these are called respectively the "oscillating" and the "trunk" engine. In the former (which has rarely been used except for marine engines), the crank-shaft is above the cylinder, the piston-rod head is attached to the crank-pin, and the connecting-rod is dispensed with by allowing the cylinder to oscillate on large hollow centers called *trunnions*, and so to adapt itself to the various positions of the crank-pin. In the "trunk" engine, the piston-rod becomes a hollow cylinder or *trunk*, large enough to allow the connecting-rod to vibrate inside it. The latter is then attached at one end to the crank-pin as usual, and at the other to a pin fixed in the piston.

An immense amount of ingenuity has been expended in devising engines in which the rotary motion of the shaft is obtained *directly* from the piston without the intervention of reciprocating parts. These machines are called *rotary engines*; they have never come into general use, and most of them have been defective in construction, as well as founded on a dynamical misconception.

In *locomotive engines* it is necessary that the whole machinery should be compressed into the smallest possible bulk, and this necessity is the cause of their principal peculiarities. The engine itself is much the same as an ordinary horizontal engine, and has

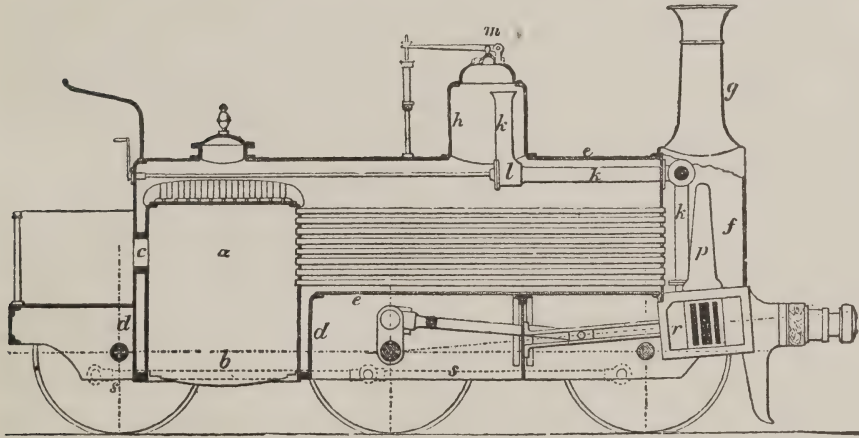


FIG. 5.

two cylinders placed side by side near the front of the locomotive. These cylinders are sometimes placed inside the main framing, which runs the whole length of the engine, and sometimes outside it, each plan having certain advantages. Fig. 5 is an outline section of an "inside cylinder" freight locomotive belonging to the Midland railway company. At the back of the locomotive is the fire-box *a* the bottom of which is formed by the grate *b*. Fuel is introduced by the door *c*. The fire-box is inclosed in a casing *d*, and the space between is filled with water. This space communicates freely with the barrel *ee* of the boiler, a long wrought-iron cylinder. From the back of the fire-box numerous small tubes traverse the boiler (through the water) to the smoke-box *f*, and conduct the products of combustion to the chimney *g*. The steam-pipe *k* is led away from near the top of the dome *h*, and fitted with a regulator valve *l*. At *m* are a pair of spring safety-valves. Both cylinders discharge their steam through the vertical blast-pipe *p*, and by this means a sufficient draught is caused, notwithstanding the small height of the chimney. The "compound" system explained below is gradually being applied to locomotives, and gives marked economy. The high-pressure cylinder is placed on one side of the locomotive and the low-pressure cylinder on the other.

In all *marine engines*, except the very smallest, two cylinders are used, working cranks at right angles to each other, so as to equalize the motion as far as possible, it being almost impossible to use a fly-wheel of sufficient weight for that purpose on board ship. In vessels of war, where it is essential that all the machinery should be kept below the water-line, horizontal engines are used, often of the "trunk" type. In merchant vessels, however, and in all cases where there is no necessity for the machinery being kept low down in the ship, the form known as the "steam-hammer" engine, or

some modification or it, is now almost universally adopted. These engines derive their name from their resemblance (in their earlier designs) to Mr. Nasmyth's steam-hammer, the form of which seems to have suggested their arrangement. They are direct acting, but the cylinders are inverted, and placed right above the propeller shaft.

The two greatest improvements in the modern steam-engine—the *surface condenser* and the *compound engine*—have been brought to perfection chiefly in connection with marine engines, and we may therefore mention them here. In the surface-condenser, the steam is condensed by contact with the surface of a great number of small tubes, through which a current of cold sea water is kept constantly flowing. By this means the condensing water and the condensed are kept separate, the former being returned to the sea, and the latter only sent into the hot-well. The boiler, therefore, is continually fed with distilled water, and the wasteful process of “blowing off,” to get rid of the unvaporizable matter which would otherwise be deposited in the boiler, is rendered unnecessary.

In “compound” engines, the two cylinders are of unequal size—the larger, called the low pressure cylinder, having from three to four times the capacity of the smaller or high-pressure cylinder. The steam from the boiler is admitted into the latter in the usual way, and cut off generally at from $\frac{2}{3}$ to $\frac{3}{4}$ of the stroke; and after doing its work there, it is conducted to the large cylinder, where its reduced pressure, by acting on an increased area, does as much work as in the other cylinder, and thence to the condenser. This system of engine has several notable advantages—among which are that the internal stresses are more uniform than in ordinary engines; that leakage past the piston becomes of less importance; and that for any given *large* measure of expansion, the mechanism of the engine is much more simple and less liable to get out of order than for the same degree of expansion carried out independently in two cylinders. The next step was the triple-expansion engine, in which three cylinders are used, through which the steam expands successively. The most modern marine engines are of this class.

The Work Done by Steam-engines.—This is estimated in two ways—as *horse-power*, and as *duty*, and the first expression includes two things—nominal and indicated horse power. Thirty-three thousand foot-pounds of work done per minute is called one horse-power, this being considered by Watt as the maximum force which a strong horse could exert. The *nominal* horse-power of an engine has long ceased to be any expression of the actual power it exerts; it is only used as a kind of commercial standard (a very deficient one) for the sale and purchase of engines, and is generally made to depend entirely on the diameter of the cylinder.

The indicated horse-power is the most useful measure we have of the work done by an engine. It expresses, however, the total work done by the steam on the piston, and does not show at all what proportion of that work has to be expended in overcoming the friction of the engine itself. It is ascertained by the use of a little machine called an “indicator,” devised by Watt, and since his time greatly improved, especially by Mr. Richards.

By taking the *mean* pressure per square inch on the piston throughout the stroke (deduced from the indicator card), and multiplying it by the area of the piston, and by the number of feet passed through by it in a minute, we should find the number of foot-pounds of work done by the engine per minute; and this, divided by 33,000, would give the indicated horse-power.

“Duty” is a measure of power used only for pumping engines, and differs from horse-power in being entirely independent of time. It is the number of foot-pounds of net work resulting from the consumption of a given quantity of coal, usually either a bushel of 94 lbs. or a hundred weight. At the beginning of this century the maximum duty that had been attained by any Cornish engine was 20 millions of foot-pounds per cwt. of coal, but six times that duty has since been occasionally obtained. In these engines, it is the actual net work done which is taken into account; the duty would be 20 or 25 per cent. greater if the total load on the steam-piston had been considered instead.

For engines whose power can only be measured by the indicator, the standard of economy is the number of lbs. of fuel used per hour per indicated horse-power. In factories where “dross” is used as fuel, with horizontal engines and Cornish boilers, and where no means are taken to insure economy, we have known 15 to 20 lbs. of fuel burned per indicated horse-power per hour. In marine engines and other cases where the best coal only is used, and where high pressures, surface condensation, and compound cylinders are employed, the consumption of fuel is often as low as 2 pounds.

The theory of a “perfect heat-engine,” which should return in mechanical work (see **FORCE**) the greatest possible amount of the heat supplied to it, is considered under **THERMODYNAMICS**. For other points, see articles **BOILER**, **SAFETY VALVE**, and **SCREW PROPELLER**, as well as **STEAM**. See *A Manual of the Steam Engine* by R. H. Thurston (1892).

STEAM-HAMMER, THE, has doubtlessly contributed more than any other mechanical invention of modern times in developing the wonderful resources of the iron trade, and is still looked upon as a marvel of engineering skill and ability. The first idea of a steam-hammer appears to belong to James Watt, the great father of engineers, and was patented by him in 1784. In 1806, a William Deverell, described as “an engineer of

Surry," also took out a patent for a steam-hammer; but in neither case does it appear that steam-hammers were actually constructed. From this time till 1839, the idea seems to have been entirely lost sight of, when it was again taken up by Mr. James Nasmyth, of the Bridgewater foundry, Patricroft, near Manchester, as the result of an application made to him by Mr. Francis Humphreys, engineer to the Great Western Steamship company, who had been unable to induce any forge-master to undertake the forgings required for the paddle-shafts of the *Great Britain* steamship, then in course of construction. Mr. Nasmyth sent a sketch of his hammer plan to Mr. Humphreys, who, along with Mr. Brunel and others, heartily approved of the scheme, but in consequence of an alteration being made in the propelling arrangement of the great ship, the paddle-shaft was not required, and the hammer was not then constructed. The scheme was offered to many of the large forge-masters and engineers; but while all seemed to admire the idea, they failed to appreciate its value and importance, and the hammer remained a mere sketch in Mr. Nasmyth's "scheme-book" till 1842, when, in June of that year, Mr. Nasmyth secured a patent for his invention, and the first steam-hammer was made in accordance with his plan at the Bridgewater foundry early in 1843; but although considered by some as an improvement upon the old "helves" hitherto used for forging purposes, it was very far from being a perfect or even a marketable tool. The hammer was worked by means of an ordinary slide-valve and a long lever, requiring great labor and constant attention in order to give the blow required; so that some contrivance was necessary, capable of adjustment, in order to have complete command over the power of the blow, and that, the instant the blow was struck, the block should rise again, so that not only no loss of time should ensue, but that the heat in the mass of iron on the anvil might not be reduced or carried off by the cold face of the block. The peculiar difficulty of securing a true automatic arrangement will be seen when it is considered that the instant of percussion must vary with almost every blow that is struck; for the piece on the anvil becomes thinner and thinner by each succeeding blow, and in flat bars a blow is first given on the flat side, and then on the edge, the difference in the fall of the hammer in the two cases being oftentimes several inches; and further, that the hammer must be under perfect control at all times.

Mr. Nasmyth, after many and protracted trials, failed to produce the motion required, and, as a consequence, the whole hammer scheme was on the point of being abandoned. In this dilemma, and during Mr. Nasmyth's absence from the works, his partner, Mr. Gaskell, applied to their engineering manager, Mr. Robert Wilson, who afterward became managing partner and successor to Mr. Nasmyth, to endeavor to solve the problem which had hitherto baffled the skill of Mr. Nasymth. Mr. Wilson took the matter in hand, and in little more than a week, a motion was invented and attached to a hammer upon which former experiments had been made, and was at once found to answer most admirably every condition required. Under the influence of this very beautiful mechanical motion every variety of blow could be given, from the gentlest tap to the heaviest blow within the compass of the hammer, and that, too, perfectly self-acting in every respect, the long lever and the hard work before referred to being now entirely banished. By simply altering the position of the tappet lever by means of two screws, a blow of the exact force required could be produced and continued so long as steam was supplied. So completely was the hammer now under control, that it became a favorite amusement to place a wine-glass containing an egg upon the anvil, and let the block descend upon it with its quick motion; and so nice was its adjustment, and so delicate its mechanism, that the great block, weighing perhaps several tons, could be heard playing tap, tap, upon the egg without even cracking the shell, when, at a signal to the man in charge, down would come the great mass, and the egg and glass would be apparently, as Walter Savage Landor has it, "blasted into space." On Aug. 18, 1843, the first hammer was delivered to Messrs. Hird, Dawson, and Hardy of the Low Moor iron works, near Bradford, Yorkshire, and gave such satisfaction, that orders for this remarkable tool began to flow in from all parts of the country. The hammer remained in this condition, with the exception of a few minor details, from 1843 to 1853, when Mr. Wilson (who in the interim had removed to the Low Moor iron-works) invented, patented, and applied to the hammers at Low Moor and elsewhere what is called the "circular balanced valve." The *Practical Mechanic's Journal* for 1855, vol. viii., p. 174, in an article on this invention, says: "The wonders of Mr. Nasmyth's invention, the steam-hammer, have just received new luster at the hands of Mr. Wilson, to whom belongs a large portion of the credit attaching to the early practical development of the beautiful automatic action of this invaluable tool. The special feature which Mr. Wilson has introduced is his balanced-pressure cylindrical valve, several modifications of which we noticed in our pages of June and July last year. Hammers divested of all self-acting apparatus whatever, and fitted merely with a hand-gear valve of this kind, exhibit an immensely improved action, enabling the workman to obtain the exact kind of blow he wants under all circumstances. This adjustment of the hammering force is attained just as effectually as with the simple hand-hammer of the smith, one stroke giving perhaps a mere touching tap, and the next a blow of the highest intensity."

In July, 1856, Mr. Wilson returned to the Bridgewater foundry as managing partner in the firm of James Nasmyth and company, and in September following obtained a pa-

tent for a *balanced slide-valve*, and at once arranged to apply his invention to all hammers subsequently to be made there, which arrangement continues in operation to the present time. His balanced slide-valve, by a most ingenious arrangement, allows the valve, as it were, to float in an atmosphere of steam pressing equally upon it on every side, entirely doing away with all superincumbent pressure upon the *valve*, no matter what the pressure in the *boiler* may be. The great advantage of this invention will be apparent when it is stated that hammers are now made of such a size, that, if the valve were not balanced, a small steam-engine would be required to move it.

In June, 1861, Mr. Wilson patented and introduced another very important improvement, popularly known as the *double-acting hand-gear motion*. By this arrangement, the steam is admitted as before to *raise* the piston, and when it has attained the required elevation, and at the very moment when about to descend, by slightly increasing the travel of the hand-lever (more than when working single-acting), the steam is admitted into the cylinder *above* the piston, which accelerates and increases the intensity of the falling blow and the consequent capacity of the hammer; so much so, that that which had hitherto been described as a *five-ton* hammer is by this double-action arrangement increased to at least a $12\frac{1}{2}$ or 15 ton one.

In 1862, Mr. Wilson designed and constructed a small hammer suitable for tilting steel, fitted with the balance-valve, double acting, and with an entirely new self-acting motion (much less complicated than the original one) capable of striking *five hundred* blows per minute. There are many patents for this kind of hammer, which is now very largely used in the forging of steel.

The largest steam-hammer ever constructed is at the steel-works at Bethlehem, Pa. The cylinder is 76 inches in diameter, and it has a stroke of $16\frac{1}{2}$ feet. The weight of the piston, piston-rod, and trip together is 125 tons, and the anvil foundation is composed of 22 blocks of iron, each weighing 70 tons. There are 1800 tons of iron and steel in the foundation of this machine. Another large steam-hammer is at Perm (a town in the n.e. of Russia), and is used for the manufacture of large cast-steel guns. It is a 50-ton hammer, made double-acting in the way above mentioned, so as to be equal to a 100-ton single-acting one. Its anvil-block is the largest casting ever made, weighing considerably more than 500 tons.

STEAM-HEATING. See WARMING AND VENTILATION.

STEAM-NAVIGATION. When once steam was known as a moving power, its application to navigation was obvious enough: it was even to this purpose that the first attempt was made to apply it at all—that of Blasco de Garay—namely, in the harbor of Barcelona in 1543. See STEAM-ENGINE. The only surprising thing is, that 30 years should have elapsed—between 1777, when the steam-engine had become in Watt's hands an efficient power for other purposes, and 1807, the date of Fulton's first voyage—before a really serviceable steam-vessel was produced. The connecting link seems to be the use of revolving-paddles instead of oars. Wheel-boats propelled by oxen, horses, or men were known to the Romans, and were used for ferry-boats in modern times. Some experiments with this mode of propulsion made by Mr. Miller of Edinburgh, suggested to his friend Mr. Taylor the application of steam as the moving power, and led to the most decided step in the discovery of steam-navigation previous to the final success of Fulton.

As early as 1736 Jonathan Hulls had taken out a patent for a tow-boat to be propelled by a paddle-wheel set in motion by a sort of steam-engine. The project appears never to have been executed. Besides some experiments on the Seine by comte d'Auxiron in 1774, and Perier in 1775, the marquis de Jouffroy constructed a steamboat of considerable size in 1782 which navigated the Saône for some time; it was deficient, however, in power. In America experiments began to be made about 1783 by Fitch and Rumsey. Fitch launched a paddle steamboat in 1788 which moved at the rate of 4 m. an hour; but before proceeding far the boiler burst. Rumsey proposed to propel the vessel by making a stream of water issue with force from the stern; his attempt failed.

The next important experiment was the one above alluded to, by Messrs. Miller and Taylor. It took place on a small lake on Mr. Miller's estate of Dalswinton in Dumfriesshire. A small engine having 4-in. cylinders of brass was prepared, under the superintendence of Mr. Taylor, tutor in Mr. Miller's family, and Mr. Symington, an ingenious mechanic, and fitted on board a double boat, with a paddle-wheel in the interspace. The trial took place amid a concourse of hundreds on Oct. 14, 1788, and with perfect success. Next year Mr. Miller had larger engines fitted into a vessel, and tried on the Forth and Clyde canal, when the vessel moved at the rate of 7 m. an hour. Partly from caprice, partly from derangement of his affairs, Mr. Miller was diverted from pursuing the matter further. But in 1801 Mr. Symington took out a patent for the construction of steamboats, and in 1803 built the *Charlotte Dundas*, to tow vessels on the Forth and Clyde canal. The success seems to have been complete, excepting in one respect, that the agitation of the water by the paddles was found to wash down the banks in an alarming manner. The use of the vessel was therefore given up, and it lay at *Lock Sixteen* for many years.

In the meanwhile, attempts had been making at steam-navigation in America by Stevens, Livingston, and others. Robert Fulton, another American, had thought of

steam as a motive-power for vessels as early as 1793. Traveling into Scotland he visited the unfortunate *Charlotte Dundas*, and obtained drawings of the machinery. Returning to America with one of Boulton and Watt's engines of 20 horse-power, he, in conjunction with Livingston, built a vessel called the *Clermont*, at New York, and in 1807 made the first really successful voyage by steam from New York to Albany, up the Hudson. The vessel sailed 110 m. in 24 hours, against stream and wind. Fulton has thus indisputably the honor of having first proved the practical utility of steam-navigation. Yet nothing but perseverance seems to have been wanting to crown the experiments of Miller, Taylor, and Symington with equal success. Four years later, 1811, Henry Bell of Glasgow, who had witnessed the experiments on the canal in 1789, and had accompanied Fulton on his visit to the *Charlotte Dundas*, started a steamboat, the *Comet*, on the Clyde, and was thus the father of steam navigation in Britain. The first American steamer to cross the ocean was the *Savannah*, which sailed from Savannah, Ga., May 25, 1819, and reached Liverpool June 20.

In 1815 a steamboat made a passage from Glasgow to London, and in 1818 one plied from New York to New Orleans; it was not till 1820 that steam-packets were established between Holyhead and Dublin. 1838 was a memorable year in the history of steam-navigation. The steamer *Sirius* sailed from Cork on April 4, the *Great Western* from Bristol on the 8th of the same month; both arrived at New York on the 23d, the *Sirius* being only twelve or fifteen hours before the other. The passage is now often made from New York to Queenstown in less than six days. Steam-vessels are now to be found on all seas and lakes and navigable streams. War-steamers have taken the place of the old ships of the line; and except for the transport of heavy goods to long distances, steam bids fair to supersede the use of sails. The maximum speed yet attained by steam-vessels is 20 m. an hour; the ordinary rate 8 to 15 miles.

The steam-engine employed to propel a vessel does not differ essentially from any other; but some modifications are necessary to suit the special circumstances under which they work. In ships of war, the cylinders are generally placed horizontally, and the whole machinery kept below the level of the water-line; in merchant vessels, vertical engines are more commonly used, with the cylinders inverted, placed right above the propeller-shaft. For working paddle-wheels, oscillating engines were, on the whole, the most common.

All the recent ships of the trans-Atlantic lines have been built of great size, and fitted with powerful engines. In length they are between 450 and 500 ft., breadth of beam 45 to 55 ft., and depth 30 to 40 ft. Their carrying capacity is between 5000 and 8000 tons. Many of them have been built with double bottoms, not only adding greatly to their strength and safety, but also giving space between the two which is divided into compartments for carrying water ballast. The engines of these ships are from 10,000 to 14,000 horse-power. The western passage has been made in a little less than six days. All these ships have 8 or 10 water-tight bulkheads, which makes sinking almost impossible. Steamers are also largely taking the place of sailing vessels in the carrying trade. Efforts are being made to attain greater speed than has been reached, and with steamers built entirely with the view to carrying passengers this will no doubt soon be accomplished. Twin or double screws have been used, but mainly on war ships; an appliance in the nature of a brake for suddenly stopping ships has been invented.

Since 1874 the problem of speed has been prominently before the minds of steam-ship builders, and next to the increase in the comfort of passengers secured by marine architects, their wonderful success in cutting down the time of ocean voyages deserves special consideration. The first condition for attaining a high degree of speed is the fineness of the ship's form, or of her "lines," for the reason that speed depends upon the least possible disturbance in the water surrounding the vessel; or, to put it more exactly, "the measure of efficiency of form for the maximum speed is inversely as the height of the waves of disturbance." When a ship is making the maximum speed for which it was designed, the waves of disturbance should not be very high, and the "wake" or area of disturbance left behind in the track of the vessel should be a narrow one. Mr. A. E. Seaton gives the following statement of the problem:

"It is usual to judge of the forms of ships by the relation they bear to rectangular blocks of the same dimensions: that is to say, a ship whose dimensions are—length, 100 feet; breadth, 20 feet; draft of water, 10 feet; and whose displacement is 12,000 cubic feet, would be said to have a fineness of 0.6, or that her fineness was 60 per cent., inasmuch as a rectangular block of the same dimensions would be 20,000 cubic feet. "This, however, is not an absolute test of the fineness of the water-lines of a vessel, and it can only be used as such on the assumption that the midship sections of ships are of similar form. The best test of the fineness of water-lines is made by taking the displacement as a percentage of a prism whose length is that of the ship and whose section is the same as the midship section of a ship; assuming, however, that the midship section of all ships is approximately that found in general practice to-day, in speaking of co-efficients it will mean the percentage of the rectangular block above named."

A great gain in speed, safety, and convenience was made when the screw was substituted for the old paddle-wheels. The paddle-engine is heavier and bulkier than the screw-engine; it is more expensive; it occupies the best part of the ship; it involves more wear and tear; and a paddle-steamer occupies more space; and there is always the

danger that if the shaft were to break, and one of the wheels were to fall clear of the ship, the vessel would be likely to capsize. The counterbalancing advantages of the paddle-steamer are these : it is more readily started and checked ; there is somewhat less rolling in heavy seas, and it requires less draft of water than the screw-steamer, though the employment of two screws, one on each side instead of one amidships, has reduced largely the necessary draft of the ship, which in the case of a single screw is to be not less than the ship's diameter. Moreover, there is superior safety in the twin-screw, both from the division of the engine-rooms and from the fact that if one engine breaks down it is unlikely that the other will do so at the same time ; while in the case of accident to the steering-gear, the ship could still be guided by the regulation of one or both of the engines. These advantages were partially demonstrated at the time of the accident to the Inman steamer, *City of Paris*, in 1890.

A very important aid to the construction of swift steamers was the introduction of the Siemens-Martin steel in 1875, which made it possible to work these ships economically. This steel is 50 per cent. stronger than iron, and thus admits of such a decrease in the weight of the hull as will allow the ship's lines to be made much finer while retaining the same carrying power. This material has reduced, too, not merely the weight of the hull, but that of the machinery, by nearly 60 per cent. Again, the introduction of the compound-engine, the triple-expansion engine, and latterly the quadruple-expansion engine have reduced the required coal-consumption from 4 pounds per indicated horse-power as low as $1\frac{1}{4}$ pounds of coal per horse-power.

Finally, the resistance of the hull of the ship by friction as it passes through the water, which is very great, has been largely reduced by smoothing the surface with a coating of enamel paint which is extremely slippery when in the water. This needs to be frequently renewed, as barnacles and vegetable growths adhere to it when affected by the sea-water, and ultimately reduce the speed by several knots.

The cost of the modern passenger steamships plying between New York and Europe is enormous, as is also the expense of each voyage. A first-class merchant steamer of the usual type costs about \$140 per ton weight of the hull and \$65 per indicated horse-power of the engines. A passenger steamer, of course, costs more proportionally, and in case it develops a high speed, it is rated at a very high figure. The Guion steamer *Alaska* of 7000 tons, cost \$1,750,000. The *Majestic* is valued at \$2,500,000. The gross cost of each passage made by the latter vessel is estimated in round numbers at \$20,000.

The most remarkable exhibitions of speed have been made by some of the modern vessels of war, among which are the fastest ships now in existence. Our own navy now contains some ships of very high speed. The *Baltimore*, *Philadelphia*, and *San Francisco* (protected cruisers) have a record over the measured mile of 19 knots per hour ; the *Newark*, on her trial trip in 1890, made 19.7 knots ; the new cruiser, known as "Cruiser No. 12," which has excited great interest among foreign naval experts, is to have a steaming capacity of 21 knots. The highest speed of any naval vessel is attained by the two United States torpedo-boats *Stiletto* and *Cushing*, the former making 22 and the latter 23 knots per hour. The swiftest cruisers in the English navy (the *Narcissus*, *Immortalité*, *Australia*, *Galatea*, *Orlando*, *Undaunted*, and *Aurora*) have a record of only 18.5 knots ; though in 1891 several of 20 knots were nearly completed.

It must be remembered, however, that the high speed of war-ships is generally intended to be maintained for a short time only. Therefore the achievements of vessels engaged in the transportation of passengers are more interesting, because they represent a degree of speed that is continued day after day with no intermission until the end of the voyage, and during the most unfavorable weather. It is in the Atlantic passenger traffic between England, France, Germany, and New York that the most remarkable voyages have been made, and the rivalry between the fast vessels of competing lines is so intense as to give to each voyage something of the character of an ocean race. From 1839 until 1862, the average length of a passage between New York and Queenstown had been from 10 to 12 days ; but in the last-named year, the Cunard paddle-steamer, *Scotia*, crossed in 8d. 4h. 30m., making the first great "ocean record," which it has since been the continual effort of ship-builders to cut down. In 1873, the Inman Line built the iron screw steamer, *City of Richmond*, which made a new record of 7d. 18h. 50m., soon reduced by its sister ship, the *City of Berlin*, to 7d. 14h. 12m. The White Star steamers, *Germania* and *Britannia*, cut this record down by several hours, as did the Guion vessel, *Arizona* ; but it was the Cunarder, *Servia*, that first made the voyage in less time than seven days (6d. 23h. 50m.). The six-day record has been broken by the White Star ships *Majestic* and *Teutonic*, by the Inman vessels, *City of New York* and *City of Paris*, and by the Cunard steamers *Campania* and *Lucania*, the last having made the best record up to Oct. 1, 1894, from New York to Queenstown in Sept., 1894, the voyage occupying 5d. 8h. 38m. On Aug. 5, 1891, the *Majestic* of the White Star line made a fine record, by completing the voyage from Queenstown to New York in 5d. 18h. 8m. The *Teutonic* (Aug. 19) made the same run in 5d. 16h. 31m. On the Pacific Ocean, the fastest passage was made in 1891 by the steamer *Empress of China*, from Yokohama to Vancouver in 10 days, two days less than any previous passage.

The following table gives the principal records of the voyages between New York and Queenstown, from 1836 to 1891 :

NAME OF SHIP.	Paddle or Screw.	When built.	Length on Water-line.	Breadth.	Draft.	Horse-power.	Tonnage.	Trial speed.	CYLINDERS.		Working pressure.	Time occupied on quickest passage.
									Diameter in inches.	Stroke in inches.		
Sirius.....	Paddle	1836	170 0	..	..	270	700	..	.....	..	Lbs	D. H. M.
British Queen.....	"	1839	234 0	40 4	16 0	500	2,016	8.5	Two 77½	84	..	18 11 15
Liverpool.....	"	1839	210 0	36 0	..	404	1,150	..	Two 75	84	..	11 18 5
Great Western.....	"	1838	212 0	35 4	16 0	450	1,340	..	Two 73	84	..	10 10 15
Scotia.....	"	1862	366 0	47 9	22 0	1,000	2,358	13.9	Two 100	144	..	8 4 30
City of Richmond.....	Screw.	1873	440 0	43 6	..	700	4,780	..	68 and 120	60	..	7 18 50
City of Berlin.....	"	1874	448 6	44 2	..	1,000	5,526	..	41, 65, and 101	66	..	7 14 12
Germanic.....	"	1874	455 0	45 2	23 7	Indicated 5,400	5,008	16.0	Two 48 and two 83	60	70	7 11 37
Britannic.....	"	1874	455 0	45 2	23 7	5,400	5,004	16.0	Two 48 and two 83	60	70	7 10 53
Arizona.....	"	1879	450 0	45 1	18 9	6,300	5,164	17.0	One 62 and two 90	66	90	7 3 30
Servia.....	"	1881	515 0	52 0	23 ¾	10,300	7,392	16.9	One 72 and two 100	78	..	6 23 50
City of Rome.....	"	1881	542 6	52 0	21 ½	11,890	8,144	18.23	Three 46 and three 86	72	90	6 21 4
Alaska.....	"	1881	500 0	50 0	21 0	10,000	6,932	18.0	One 68 and two 100	72	100	6 18 37
Oregon.....	"	1883	501 0	54 2	23 8	13,300	7,375	18.3	One 70 and two 104	72	110	6 9 51
Umbria.....	"	1884	500 0	57 2	..	14,320	8,128	19.0	One 71 and two 105	72	110	6 6 8
Etruria.....	"	1884	500 0	57 2	..	14,320	8,120	19.5	One 71 and two 105	72	110	6 1 47
City of New York.....	"	1888	527 0	63 0	..	18,400	10,500	20.13	Two sets 45, 71, and 113	60	150	5 23 7
City of Paris.....	"	1888	527 0	63 0	..	20,100	10,500	21.952	Two sets 45, 71, and 113.	60	150	5 19 18
Majestic.....	"	1889	565 0	57 6	26 0	17,000	9,861	19.87	Two sets 43, 68, and 110	60	180	5 18 8
Teutonic.....	"	1889	565 0	57 6	26 0	17,000	9,686	21.0	Two sets 43, 68, and 110	60	180	5 16 31

The best record between Southampton and New York was made by the American steamer *New York* in Sept., 1894, in 6d. 7h. and 14m.; and between Havre and New York by the French steamer *La Touraine* in 1891, in 6d. 21h. The approximate distance from Sandy Hook (N. Y.) to Roche's Point (Queentown) is 2800 miles; to Southampton, 3100 miles; and to Havre, 3170 miles.

Much thought has been given to the consideration of the question how far this increase in speed can be expected to continue. The greatest continuous speed of any ocean steamer so far has represented an average of not quite $23\frac{1}{2}$ knots per hour, developed by a horse-power of nearly 30,000, or of 15,000 upon each screw. It is now believed by experienced engineers that more than 30,000 horse-power cannot safely be applied to a single ship, and this limit has already been reached in the case of the Cunard steamship *Lucania*, a twin-screw steamer. This amount of power had never before been applied to both shafts of a twin-screw steamer, making a maximum of 30,000 horse-power, until the Cunarder *Campania* in 1893 made 560 knots (645½ statute miles) in one day.

The English engineer, Mr. J. R. Ruthven, in a paper read in 1890, expressed an opinion to the effect that "the screw has reached the limit of perfection," and added that the next great gain in ocean speed would result from the application of a new method of propulsion. Of those that have been suggested to take the place of the methods now in use, the turbine-wheels, pulsometers, ejectors, and pumps—all depending on the ejection of a jet of water into the sea—have hitherto proved unsuccessful by reason of the friction produced in the rapid passage through the pipes into the sea. This method received a very thorough test in 1866 by the British Admiralty, when the iron-clad *Waterwitch*, a vessel of 1200 tons, was fitted with a complete hydraulic propeller designed by Ruthven, but developed only 801 indicated horse-power and a speed of nine knots per hour. See an interesting paper by Mr. A. E. Seaton in *Scribner's Magazine* for July, 1891; and the articles, BULKHEAD; TWIN SCREW; IRON; SHIP; STEAM-ENGINE; PADDLE-WHEEL; SCREW PROPELLER; WHALEBACK.

STEAM PUMP. The simplest steam pump is the siphon pump, which acts upon the principle of the tromp (q.v.), except that the motion of steam causes the motion of the water, while in the tromp the motion of the water propels the air. A tube through which the steam is forced enters a hollow globe to a little beyond its center. On either side of this tube are openings into the globe for the entrance of water. These openings are much larger than the steam pipe. Opposite the latter is the exit tube for the mixed steam and water, having a trumpet shape and a length of about once and a half times the diameter of the globe. The rush of steam across the semi-diameter of the globe and through this funnel produces exhaustion in the lateral halves of the globe, into which spaces the water is forced by the external pressure of the air. The first direct acting piston pumps were probably invented by Mr. H. R. Worthington of New York, while making experiments for canal steam navigation in 1840. He patented a steam pump for feeding marine boilers in 1844. The steam cylinder was fed through a pipe which had a

valve at the other end within the boiler. To this valve there was adjusted a float which controlled the supply of steam, which extended the cylinder through a slide valve which was acted upon by a spring controlled by the motion of the piston. The present Worthington steam pump was evolved from this apparatus. It is a combination of pump and steam cylinder, driven by direct action and without intervention of fly-wheel or any appliance for producing rotary motion. The steam cylinder has the usual arrangement for the entrance and exit of steam, and the rod and piston is attached to a plunger of a double acting pump. At the middle of the piston rod, between the pump and steam cylinder, there is attached an arm which in passing to and fro strikes the long end of a lever, which changes the steam valves so as to alternately admit steam on one side or the other of the piston. Various improvements have been made to control the action of the slide valve. One method is the employment of a secondary cylinder and piston, to which steam is admitted by a sub-valve, acted upon by the main piston, near the end of the stroke. Another method is the employment of a fly-wheel. We will first mention those pumps having an attached crank and fly-wheel. Of these an example is furnished by the Eclipse steam pump, made at Pittsburg, Penn. The crank-shaft actuates a rocking lever, which moves the slide controlling the admission and exhaust of steam. The Clayton pump, made at Brooklyn, N. Y., has a yoke which couples the piston and pumping rods, and answers for the support of the crank-shaft journal. One end of the shaft, by suitable attachments, controls the valve, while the other supports the fly-wheel. These fly-wheel pumps have the advantage of a perfect control of the steam valve. The direct acting pumps have been the subject of many inventions, the principal object sought being the arrest of the piston at any rate of speed at a proper distance from the cylinder head. This has been accomplished by various devices. We have not space to describe the different forms of apparatus, but will mention the following as good examples:—Knowles's steam pump, which employs an auxiliary piston-valve or chest-piston, which has a reciprocating and rotary motion, which imparts motion to the main valve; Blake's steam pump, in which both the main and the auxiliary valves are plain, flat slide-valves, the auxiliary valve being a continuation of the ports of the main cylinder, and therefore forming a movable valve-seat; the Cameron steam pump, in which the steam-piston, at the end of the stroke, acts upon valves at either end of the cylinder, alternately admitting and exhausting steam; the isochromal steam pump, made at Hamilton, Ohio, which has a governor to regulate the strokes of the piston; and the National steam pump, in which the valve-gear consists of a main piston-valve, doing the work of an auxiliary piston, the valve stem performing the office of an auxiliary valve. See *illus.*, PULLEY, ETC., vol. XII.

STEAMSHIP. See STEAM NAVIGATION.

STEARIC ACID AND STEARINE. The composition of stearic acid is represented by the formula $C_{18}H_{36}O_2$; this acid being one of the solid fatty acids represented by the general formula $C_nH_{2n}O_2$. It exists as a glyceride (stearine) in most fats, and is especially abundant in the more solid kinds, such as mutton-suet. It is readily obtained by saponifying suet, and decomposing the hot solution of the soap by hydrochloric acid. The oily acids which are thus liberated are compressed between hot plates, by which means most of the oleic acid (q.v.) which is present is expelled. The solid residue is then to be repeatedly crystallized from alcohol, and afterwards from ether, till the fusing-point becomes constant at 158° F. (70° C.). If the final solution is allowed to cool slowly, the acid is deposited in beautiful, colorless, transparent rhombic plates. After fusion, it cools into a wax-like, glistening, crystalline mass, devoid of taste or smell. It is insoluble in water, on which it floats, but dissolves in alcohol and ether, its solution reddening litmus powerfully. When heated above its fusing-point it becomes decomposed. It may, however, be distilled under diminished pressure. Stearic acid forms both normal and acid salts. The only normal stearates which are soluble in water are the stearates of the alkalies, whose solutions are frothy and form a lather, but on the addition of an excess of water, separate into an acid salt which is deposited in silky crystalline plates, and the free alkali which remains in solution. The stearates of the alkalies are also soluble in alcohol. Chloride of sodium (common salt) has the property of separating the alkaline stearates from their solution. The stearates of the alkalies are the principal constituents of the different kinds of soap. The other stearates are insoluble. Stearate of lead, which is one of the constituents of lead-plaster, is readily formed by mixing solutions of stearate of soda and acetate of lead, when the stearate of lead falls as a heavy amorphous precipitate, sparingly soluble in alcohol or ether, but dissolving freely in oil of turpentine.

The *bassic acid* extracted from the oil of the seeds of *bassia latifolia*, a tree growing in the Himalayas, and the *stearophanic acid* obtained from the berries of *monospermum cocculus*, are identical with stearic acid.

The use of stearic acid in the manufacture of candles is described under the head CANDLE. See also OILS.

STEARNS, a co. in central Minnesota, having the Mississippi river for its e. boundary; drained by Sauk river and Sauk lake, with other small lakes and streams; 1334 sq. m.; pop. '90, 34,844, chiefly American. It is intersected by the Great Northern and the Northern Pacific railroads in the n.e. Its surface is hilly in the w., and well wooded with forests of maple, ash, oak, elm, etc. The soil is adapted to the production of grain, tobacco, wool, and dairy products. Live stock is extensively raised, and the

manufactures include carriages, wagons, agricultural implements, furniture, ale, beer, and flour. Co. seat, St. Cloud.

STEARNS, MARCELLUS LOVEWELL, b. Lovell, Me., 1839, was educated at Waterville acad. and Colby univ., and admitted to the bar. He served in the civil war, and lost an arm at the battle of Winchester; was a member of the constitutional convention of Fla., 1868, and speaker of the assembly for two terms. He was U. S. surveyor-gen. of Fla., lieutenant-gov., and gov. of that state, 1874-77.

STEARNS, WILLIAM AUGUSTUS, D.D., LL.D., 1805-76; b. Mass.; graduated at Harvard college, 1827; studied theology at Andover seminary; ordained pastor of a Congregational church, Cambridgeport, 1831; became president of Amherst college, 1854, retaining the office till his death. He published *Infant Church Membership; Life and Select Discourses of Samuel H. Stearns*; besides *Sermons and Addresses*, and articles in the *Bibliotheca Sacra*, *Biblical Repository* and *New Englander*. His son, long a merchant in Bombay, made a large gift in money for the chapel of Amherst college.

STEAROPTEN. See OILS.

STEATITE, or SOAP-STONE, a mineral principally composed of silica and magnesia, with more or less alumina and water. It is found massive, or sometimes assuming the forms of the crystals of other minerals which it has replaced. It is plentiful in many parts of the world, and is found in various parts of Britain. It is generally white, reddish white, or yellow. It is soft and greasy to the touch, easily cut, but broken with difficulty. It is used in the manufacture of porcelain. It writes readily on glass, and is used by glaziers for marking plates of glass before they are cut with the diamond. Tailors use it for marking cloth before they cut it. It is used by shoemakers, to give unctuousness to the heels of stockings, that new boots may more easily be tried on. It is sold for such purposes under the names of Briançon chalk, French chalk, and Venice talc. It readily absorbs oil or grease, and is used in powder for extracting spots of them from silken and woolen stuffs. It is the basis of rouge (q.v.). It is used for imitating engraved stones, being easily cut, and afterward hardened by heat; after which, it may be colored by metallic solutions. The *agalmatolite* or *figure-stone* of China is a kind of steatite, containing a little potash. Exquisite specimens of Chinese workmanship in this material are now familiar to every one. The earth eaten by the savages of the banks of the Orinoco and of New Caledonia is a kind of soft steatite.

STEDINGK, CURT BOGISLAUS LOUIS CHRISTOPHER, Count von, b. Pomerania, 1746; d. Stockholm; graduate of the university of Upsala, 1768; a soldier in the army; fought against Prussia; subsequently became lieutenant-col. of the royal Swedish regiment in the French army. He was an intimate friend of Count Fersen, and sailed with him in D'Estaing's fleet on the expedition to the West Indies, 1778, and as a volunteer in the American revolution. He distinguished himself as commander of a brigade at Granada and Savannah, 1779; was severely wounded at the latter. He was a member of the order of the Cincinnati; ambassador to St. Petersburg, 1790; delegate from Sweden to the peace conference at Paris, 1814.

STEDMAN, EDMUND CLARENCE, b. Conn., 1833; studied at Yale college; entered the profession of journalism in 1852 as editor of the *Norwich, Conn., Tribune*; and the following year edited the *Winsted, Conn., Herald*. In 1855 he went to New York, and soon began contributing poems to the *N. Y. Tribune*. At the outbreak of the civil war he was sent to the front by the *N. Y. World* as war-correspondent continuing until 1863. He contributed to the *Atlantic Monthly* and other leading magazines; in the meantime studied law, and in 1863 was private secretary to attorney-general Bates in Washington. In 1865 he entered into business in New York as a stock-broker, in which he continues. He has published *Alice of Monmouth and other Poems* (1864); *The Blameless Prince and other Poems* (1869); the prose works, *The Poets of America* (1886); and *Victorian Poets* (1875), etc. In 1891 he delivered a course of lectures at Johns Hopkins university, and in 1891-92, at Columbia college. He has edited with Ellen M. Hutchinson a *Library of American Literature* (1888-90). His *Victorian Anthology* appeared in 1895.

STEEDMAN, CHARLES, b. S.C., 1811; was midshipman in the navy, 1828; lieutenant, 1841; commander, 1855; captain, 1862; commodore, 1866; rear-admiral, 1871. He served in the bombardment of Vera Cruz; commanded brig *Dolphin* in Paraguay expedition, 1859-60; commanded the *Bienville* at Port Royal, 1861; silenced the batteries of St. John's Bluff, Fla., 1862; commanded sloop-of-war *Ticonderoga* in both attacks on Fort Fisher; commanding navy-yard, Boston, 1870-71; rear-admiral, 1871; retired, 1873.

STEEDMAN, JAMES BARRETT, b. Penn., 1818; in 1837 was engaged in the construction of the Wabash canal in Ohio; in 1849 organized an expedition to California but soon returned to Ohio. He was printer to congress, 1856-60. When the war broke out he was commissioned col. of volunteers, was present at Philippi, in Kentucky, at Perryville, Chickamauga, in Sherman's campaign of the Atlanta, and in the battle of Nashville. He resigned in 1866, then holding the rank of major-general. Under Johnson's administration he was collector of internal revenue at New Orleans. He d. 1893.

STEEL. See IRON: MINING.

STEELE, a co. in s.e. Minnesota, drained by Straight, Lester, and Cannon rivers; 430 sq.m.; pop. '90, 13,232, chiefly of American birth, with colored. The surface is undulating and diversified by lakes and small streams. Co. seat, Owatonna.

STEELE, a co. in eastern N. Dakota, formed in 1883; 720 sq.m.; pop. '90, 3777. Co. seat, Sherbrooke.

STEELE, FREDERICK, 1819-68, b. N. Y.; graduated at West Point in 1843; served in the war with Mexico; and was stationed in California from 1849-55. He was then ordered to the western frontier, and at the beginning of the civil war was in Missouri as maj. of the 11th infantry. In Sept., 1861, he was appointed col., and at the battles of Dug Spring and Wilson's Creek commanded a brigade. In 1862 he was promoted to brig.gen. of volunteers, and later assigned to the 13th army corps as maj.gen. of volunteers. He was in command in the Yazoo expedition and also at the capture of Arkansas Post. He was engaged in the Vicksburg campaign, and commanded the 15th corps at the capture of Little Rock. In 1864 he was in command of the department of Arkansas and aided Gen. Canby in the reduction of Mobile. In 1865 he was placed in command of the department of Columbia; in 1866 made col. of the 20th infantry, and was brevetted for his services during the war, maj.gen. of the U. S. army.

STEELE, Sir RICHARD, was born in Dublin in the year 1672. His father, who held the office of secretary to the duke of Ormond, was of an English family, but his mother was Irish; and the son appears to have inherited from her the impulsive ardor, tenderness, bright fancy, and reckless profusion immemorially ascribed to the Irish national character. He was educated at the Charter-house school, along with his illustrious friend Addison, and from thence was removed to Merton college, Oxford. Leaving college without taking a degree, he enlisted in the horse guards, for which imprudence he was disinherited by a rich relation of his mother, who had named him as heir to an estate in Wexford. In the army, he rose to the rank of capt., but was gay, thoughtless, and dissipated—always sinning and repenting, as he himself confesses. To impose a check on his irregularities, he wrote a religious treatise, *The Christian Hero*, published in 1710, the design of which was to show that no principles but those of religion are sufficient to make a great man. This public profession of seriousness had little effect on the volatile captain, and he next took to writing comedies. In 1701 he produced *The Funeral, or Grief à la Mode*; in 1703, *The Lying Lover*; and in 1705, *The Tender Husband*—the last a decided failure. About the same time, he obtained some fortune by marrying a West Indian lady, who survived the marriage only a few months; and in 1706, he got the appointment of gazetteer, with a salary of £300 per annum, and also the post of gentleman usher to prince George which added another £100 to his income. In the following year (Sept. 9, 1707), he married a Welsh lady, Mary Scurlock, who figures conspicuously in his correspondence as the "Dearest being on earth," "Dear Prue," and "Dear wife," to whom he addressed some 400 letters—admiring, apologetic, and passionate. A course of extravagance—town and country houses, horses and chariots—soon involved the pair in difficulties. Mrs. Steele had a fortune of £400 a year, and was thrifty; but the lady's mother had a life-interest in the estate, and was hard and uncongenial. Addison gave a loan of £1000, which was repaid within a twelvemonth; but he made other advances, secured by a bond on house and furniture. He put the bond in execution, sold the house and furniture, and remitted the surplus to his imprudent friend. For this seeming harshness Addison has been blamed; but it rests on good authority that the sufferer himself entertained no such feeling; he regarded the incident as a warning meant to do him service, and he met his friend again with his wonted composure and gaiety. In 1709, Steele commenced *The Tatler*, a periodical published thrice a week, containing short essays on life and manners, town gossip or *tattle*, and articles of foreign and domestic news, for which Steele's appointment of gazetteer furnished him with peculiar facilities. Addison joined cordially in this publication, and still more effectively in its successor, *The Spectator*, a daily literary journal of a higher tone and character, which was continued with unexampled success through 635 numbers. A third miscellany of the same kind, *The Guardian*, was extended to 175 numbers. Steele afterward attempted other periodicals, as *The Lover*, *The Reader*, etc., but these were short-lived. His fame rests on his essays in the *Tatler*, *Spectator*, and *Guardian*, to which he contributed respectively 188, 240, and 82 papers. In the keen political strife of that venal age, Steele fought courageously and honestly for the Hanover succession and whig principles. He lost his office of gazetteer, and was expelled the house of commons, for writing a pamphlet called *The Crisis*, in which he warned the nation that the Protestant cause was in danger. But when queen Anne died, and the whigs were again triumphant, Steele participated in the royal favor. He obtained an appointment in the king's household, was elected m.p. for Boroughbridge, and received the honor of knighthood. In 1717, Steele was nominated one of the commissioners for the forfeited estates in Scotland, and he seems to have made four annual visits to Edinburgh on the business of this commission. He was led into a controversy with Addison, a few weeks before the death of the latter, on the once famous peerage bill—a proposal by ministers for restraining the king from any new creation of peers, except upon the extinction of an old family. On this question Steele took the side of the crown, and fairly beat his opponent in argument and in temper, besides enjoying the triumph of seeing the bill thrown out. The friends, alas! met no more. The survivor struggled on among the controversies, embarrassments, and lawsuits; he was patentee of Drury Lane theater; and in 1722, he produced his admirable and successful comedy of *The Conscious Lovers*. His health now rapidly

failed. His wife had died in 1718, but he had children to solace his decline. The last three years of his life were spent in retirement in Wales, and there his checkered existence came to a close: he died at Llangunnor, near Carmarthen, on Sept. 21, 1729.

The essays of Steele eclipsed his dramas. His *Bickerstaff*, the *Spectator Club*, allegories, and short tales have the true, ever-living, dramatic spirit. In taste and delicate humor, he was greatly inferior to Addison; but in invention and insight into human character and motives, he was fully his equal. He knew the world better, and he sympathized with almost every phase of life and character except meanness and cruelty. He seems to have considered it to be his special mission to reform the minor vices and absurdities of English society. If his satire had been more keen and trenchant, or his moral lessons more formal and didactic, he could not have succeeded as he did; his essays were just adapted to the times—they insinuated morality and benevolence, and supplied innocent enjoyment mingled with instruction. The lively, natural writer and companion is never lost in the teacher, nor the gay captain of horse wholly absorbed in the author.

STEEL, Sir JOHN, R.S.A., an eminent Scottish sculptor, the son of a carver and gilder in Edinburgh, was b. at Aberdeen in 1804. He received his education as an artist at the Edinburgh academy, and afterward at Rome. On returning thence in 1830, he executed a colossal group of "Alexander and Bucephalus," which was instantly recognized as a work of great merit. The promise of this early work he has since amply fulfilled; and is now admitted to stand in the front rank of his profession. His chief works are in Edinburgh: the colossal figure of the queen crowning the front of the royal institution, which procured him the honorary appointment of sculptor to her majesty in Scotland; the statue of Scott in the Scott monument, a commission which was won in competition; the equestrian statue of the duke of Wellington (1852); statues of Wilson and Ramsay; the bronze statue of Burns in New York; and the equestrian statue of Prince Albert, at the inauguration of which in 1876 Steel was knighted. D. 1891.

STEEL TOYS. This is a manufacturing term much used in Birmingham, London, and elsewhere. It has a somewhat different meaning to that which would at first sight be given to it. Steel toys are small articles, such as cork-screws, buckles, boot-hooks, and a great variety of similar objects, when made of polished steel. Birmingham and Sheffield are the chief seats of this industry, which employs a large number of operatives and considerable capital.

STEELYARD. See **BALANCE**.

STEEN, JAN, a celebrated Dutch painter, was b. in 1636, or according to others in 1636, at Leyden, where his father was a brewer. He showed an early predilection for art, which led to his being apprenticed to a German painter, Nicholas Knupfer of Utrecht. Subsequently he became a pupil of Van Goyen, whose daughter Margaret he married. Very soon his repute became established. As he worked, however, in a slow and elaborate manner, his gains were insufficient, and he started a brewery at Delft. This enterprise promised fairly; but, according to tradition, he was by no means of steady business habits, and so bemused himself with his own beer that very soon he brewed no more of it. Little that is certain appears to be known regarding the subsequent life of Steen, but numerous unauthenticated anecdotes are in vogue, which, if it could be shown that they were true, would prove him to be a wretched drunkard; but a late biographer, Van Westerheene, throws considerable doubt on the accuracy of the popular impression. Steen died in 1679 or 1689, leaving his family in very destitute case.

As an artist of the Dutch school he ranks high; and his works are now much valued. In humor and spirit they are scarcely surpassed, and their coloring is clear, fresh, and delicate. At times he attempted historical subjects, but his success in these was not great. It was in homely and domestic scenes that his genius truly exhibited itself; and in this field he has scarcely since been quite equaled.

STEEPLE, the tower and spire, lantern, or other superstructure attached to a church. These are usually of stone, but in some cases are carried up from the floor in massive wooden framing.

STEEPLE-CHASE. This singular term is used to designate a kind of horse-race, run not on a prepared course, but across fields, hedges, ditches, and obstacles of every kind that may happen to be in the way. The name and practice are said to have both originated in a party of unsuccessful fox-hunters, on their return home, agreeing to try a race toward the steeple of a village church, the first who could touch the church with his whip to be the winner. This kind of sport soon became popular; and matches were made and sweepstakes entered into—the requirements of the course being simply two flagstaffs placed about 2 m. apart, from one of which the competitors started, made their way to the other, and returned to the starting-point. Each rider was allowed to go and come as he chose, but the country was often selected on account of its difficulty; high and strong fences, deep and broad ditches, and sometimes even swollen rivers having to be crossed and recrossed. Then came the more regular steeple-chase of modern times over a course marked out by flags, between which the rider must pass in order to win the race. This improvement was introduced about the end of last century, and no

further change took place till 1841, when *handicapping* began. This consists in the weighting of horses according to their supposed merits, without reference to age, size, or sex. The first handicap steeple-chase was run at Newport-Pagnell on April 20, 1841, and the sport has since become more and more popular in England, most of the spring and autumn meetings having their steeple-chases, for valuable stakes. Great crowds of people always attend, the very danger of the sport seeming to increase its attractiveness. Serious accidents are not unfrequent; and great courage, coolness, resolution, and judgment are requisite on the part of the rider in a steeple-chase.—The name is also applied to similar races for men.

STEERAGE, in a vessel, is the lowest class of accommodation for passengers.

STEERING APPARATUS, in antiquity, was always of one or usually two long oars, the rudder and helm having probably been invented by the Scandinavians, as all the words descriptive of their parts are old components of our language. A rudder with tiller is found on a seal as early as 1226, but no preventive tackle appear ever to be shown. The enormous length necessary for a tiller in a large ship causes the first improvement, the steering-wheel. This is a fixed windlass, on the barrel of which wind and unwind ropes carried over compound pulleys to the ends of the tiller, and to eyebolts in the side. The length of rope wound on the barrel will usually be somewhat over three times the angle traversed by the tiller, or between four and five turns to put the helm hard either way, from mid-ship. The next improvement was to suspend the rudder, not by pintles on the stern-post, but by a pivot at the bottom, leaving nearly a third on one side of the axis, as a counterpoise—the *balance-rudder*. This, very valuable on a screw ship, was needlessly powerful when under sail, and the counterpoise side was therefore made movable, and locked stiff when necessary—the *compound balance-rudder*. Still, the angle traversed being enlarged, the "work" of a steering-wheel was enormous, and in a sea a ponderous system of braces and preventer-tackle was necessary. About 1863 was introduced into the British navy the steam or hydraulic steering apparatus. The *Minotaur* had needed, to set her helm over 23°, 18 men at the wheels, 60 men at the relieving tackles, and 1½ minutes. To complete a circle required 7½ minutes. A balance-rudder would probably have increased the arc traversed to 40°. Fitted with the steam apparatus 2 men at the wheel set the rudder 35° in 16 seconds, making the circle in 5½ minutes. It is now usual to have a small auxiliary engine, an auxiliary wheel in case of accident, and for the old tiller is now substituted a yoke. There are many varieties of modern yoke wheels, both horizontal and vertical, working by pistons, by a ratchet, or by contrary-screws with levers. Steamboat rudders have long been worked from the house by the pilot, but the trouble of applying machinery to chains necessarily so long has always lain in the slack and the shock. The latest invention consists in attaching to each chain a piston which may receive steam on either side, one moving forward as the other moves aft, preventing all slack, and cushioning enough to deaden the shock almost entirely. An electrical steering apparatus has been invented, which is in use on the U. S. monitor *Miantonomah*.

STEEVENS, GEORGE, 1736-1800; b. England; educated at Eton, and King's college, Cambridge, became a draughtsman and an accomplished Shakespearean scholar, and published *Twenty of the Plays of Shakespeare, being the whole number printed in Quarto during his Lifetime*, in 4 vols. (1766). He was associated with Dr. Johnson in 1773 in the preparation of an annotated edition; and with Isaac Reed he published a revised edition (1785-93); the accepted standard for nearly 50 years. He assisted in the preparation of the *Biographia Dramatica*, and Nichol's *Biographical Anecdotes of Hogarth*; and contributed to Johnson's *Lives of the Poets*; Dodsley's *Annual Register*; and other works. His library, containing 1943 lots, was sold in 1800 for £2,740 15s.

STEFFENS, HENRIK, 1773-1845, b. Norway; studied at the university of Copenhagen; went to Germany, 1794, and through the writings and personal influence of Schelling zealously embraced the "philosophy of nature," was appointed professor of natural science at Halle, 1804; Breslau, 1811; and Berlin, 1831. In religion he was orthodox in his own country, a pietist at Halle; an Old Lutheran at Breslau, and a disciple of Schleiermacher at Berlin. In politics he advocated Jahn's Turner institutions and praised the commotions among the students of the Prussian universities. His autobiography, published in 10 vols., has been translated into English.

STEIN, CHARLOTTE ALBERTINE ERNESTINE VON, 1742-1827; b. Weimar; was a daughter of court marshal von Schardt; and in 1764 was married to baron Friedrich von Stein. Her intimacy with the poet Goethe commenced soon after his arrival at Weimar in 1775, and was broken off after his return from Italy in 1788. Her tragedy *Dido* is of literary interest, owing to its allusions to Goethe and to many of his contemporaries. She burned her letters to Goethe, but the poet's letters to her were edited by A. Schöll (1848) and Fielitz (1883). Letters addressed by Goethe and his mother to Frau von Stein's son were published in 1846. See *Charlotte von Stein*, by H. Düntzer (1874).

STEIN, HEINRICH FRIEDRICH KARL, Baron von, one of the greatest statesmen that ever conducted Prussian affairs, belonged to an old Rhenish-Franconian family, and was born at Nassau, Oct. 26, 1757. He studied at Göttingen from 1773 to 1777; entered

the service of Prussia in 1778, and in 1784 had risen to be at the head of the department of mines for Westphalia. In 1786 he visited England in company with his friends, the counts von Redern and Schlabbendorf, and carefully studied the institutions of that country, for which he conceived a high admiration, and sought to introduce them at a later period into Prussia. After several minor preferments, he was appointed, in 1797, president of the Westphalian chambers, where he displayed rare administrative talent. In Oct., 1804, he entered the Prussian ministry as chief of the department of indirect imposts, taxes, manufactures and commerce. In this capacity he effected important ameliorations, particularly by abolishing various restrictions on the internal trade of the nation; yet to his great grief and vexation he found himself incapable of modifying the policy that resulted in the French invasion and conquest. Of a thoroughly conservative and religious disposition, full of pious reverence for the past, so far as it possessed vital energy, but strongly opposed to the bureaucracy and military despotism; recognizing in the self-governing powers of communities and provinces the only practical guaranty of national liberty, yet, as a baron of the empire, hostile to the anarchic sovereignty of little states, he occupied a political stand-point which procured for him many adversaries and few friends. In 1807 he was dismissed from office by the king, and withdrew to his estate in Nassau; but the peace of Tilsit opened the eyes of his sovereign to the wisdom of Stein's policy, and in less than seven months he was recalled, with the approbation of Napoleon, who had as yet no idea of the deep and earnest patriotism of the minister. Stein's industry was untiring. Seeing clearly that, in a military point of view, Prussia was powerless for the moment, he set about developing her internal resources by attempting a series of administrative and political reforms, known as *Stein's System*—the principal of which were the abolition of serfage, with indemnification to the territorial lords; the subjection of the nobles to manorial imposts; equality of orders in the sight of the law; the universal obligation of military service; promotion in the state by merit alone, without distinction of caste; and the establishment of a municipal system analogous to that of England. Some of these reforms were carried out by Stein, and others by his successor, Hardenburg (q.v.). Meanwhile, he had become suspected by Napoleon. Among other things, an intercepted letter was brought to the French emperor, in which his policy was sharply criticised. Stein was obliged to resign (Nov. 1808), and retired to Austria, where he became the center of a secret national society—the *Tugendbund*. Napoleon, who bitterly hated patriots that stood in his way, confiscated his property. In 1812 Stein was summoned to Russia by the emperor Alexander, and contributed by his counsils to prepare the coalition against Napoleon. After the march of the allies into Saxony, he was appointed president of the council of all the German states; was a leader in all the military diplomacy of that stirring time up to the congresses of Vienna and Aix-la-Chapelle, in which, however, he took no part, owing to the intrigues of the Bavarian minister, acting for the lesser states of Germany, who knew well that he did not look with a favorable eye on their anarchic autonomy. The absolutists were also against him. Stein's active political career was now finished; henceforth he enjoyed some honorable functions, but no power, and died at Kappenberg, June 29, 1831.—See Pertz's *Leben des Freiherrn von Stein* (1855); Professor Seeley's *Life and Times of Stein* (1879); and the lives by Baur (1895) and Neubauer (1894).

STEIN'BOK. See BOUQUETIN.

STEINMETZ, KARL FRIEDRICH VON, b. Germany, 1796; entered the army in 1813 as a lieutenant; fought in the war against Napoleon, and was made a captain in the regiment of Kaiser Franz in 1835. After 1848 he was made governor of the academy of cadets at Berlin, and in the Austrian campaign of 1866 he won great distinction as commander-in-chief of the 5th army corps. He received the order of the Black Eagle, and the diet voted him a national donation for his services to Prussia. At the beginning of the Franco-German war of 1870 he was appointed commander-in-chief of the first army, but after the advance toward Metz, his army was united to that of Prince Friedrich Karl, who was placed in command. In Sept., 1870, Steinmetz was appointed governor-general of Posen and Silesia. He offered his resignation but the king declined to receive it. He was made a general field-marshal and placed in the suite. He d. 1877.

STEINITZ, WILHELM, b. Bohemia, 1837. He has been known as a chess-player for a number of years; he gained the first prize in the Vienna international chess tournament, 1873; tried with Winawer for the first prize in the Vienna tournament, 1882; and came second in the London tournament, 1883, won by Zukertort. He has traveled extensively, defeating the leading chess-players of the different countries, and giving exhibitions of his marvelous skill in simultaneous and blindfold play. He was chess editor of the *London Field*, 1873-83. He published a *Modern Chess Instructor* (1889); and edits the *International Chess Magazine*.

STEINTHAL, HEYMANN, b. Germany, 1823; after studying in Berlin lectured there on language and mythology; edited with Lazarus the *Zeitschrift für Völkerpsychologie und Sprachwissenschaft*, and has published *Die Classification der Sprachen* (1850); *Der Ursprung der Sprache* (1851); *Die Entwicklung der Schrift* (1852); *Das gegenseitige Verhältniss der Grammatik, Logik und Psychologie* (1855); *Geschichte der Sprachwissenschaft bei den Griechen* (1867); and *Abriß der Sprachwissenschaft* (1871 et seq.).

STELLARIA. See STITCHWORT.

STELLERINE, *Rytina*, a genus of *cetacea*, of the family *manatidae* (q.v.), of which only one species is known (*R. gigas*), about 25 ft. in length, a native of Behring's strait, and never observed since the middle of last century, so that it is supposed to be extinct.

STELLIO, a genus of the *agamidae* family of lizards. The *stellio cordylina* species is very common in Turkey and Arabia. A peculiar motion of its head has suggested the Mohammedan's tradition that the animal intends to mock the gestures made by them at prayer. For this supposed mockery they think it a duty to kill it.

STELVIO, PASS OF THE (Ger. *Stilfserjoch*), the highest carriage-road in Europe (9,055 ft. above the sea-level), leads from Bormio, on the Italian side of the Tyrolean Alps, near the head of the Valteline, to Glurns on the Austrian side. It forms part of the great road between Milan and Innsbruck, and was completed by the Austrian government in 1820-24, at an expense of 3,000,000 florins.

STEM, in botany, that part of the plant which, arising from the surface of the ground, and shooting upward as the root shoots downward, bears the leaves and flowers. Stems are either simple or branched. They are herbaceous or woody, solid or hollow, jointed or unjointed. Sometimes they are weak so as to be procumbent, although more generally firm and erect; sometimes weak stems are twining, or they are upheld in various other ways by the climbing habit of the plant. Stems are generally round, but sometimes compressed or angular. The arrangement of the leaves and branches, in reference to the stem, is symmetrical, but plants differ from each other in the nature of this arrangement. In the branching of trees, the symmetrical arrangement is often lost, as to the principal branches, in consequence of the death of some of them. In many plants the stem is obsolete, or so abbreviated as to be inconspicuous, forming a mere neck—the *crown of the root*—where the leaves and flower-stalks spring as at once from the root. Very important differences in the structure of stems distinguish the three great classes of plants—Acrogenous (q.v.), Endogenous (q.v.), and Exogenous (q.v.). Stems sometimes creep along the ground, or even under the ground.

STEM, of a ship, is that very powerful piece, or combination, of timber, which, being scarfed to the fore-end of the keel, rises nearly perpendicularly to form the bow and cut-water. To it are rabbeted the fore-ends of the planks. It is backed by an equally powerful timber called the stemson, bearing the same relation to it as the keelson (q.v.) does to the keel. See also SHIP-BUILDING.

STEMBEL, ROGER N., b. Md., 1810; entered the navy as a midshipman, 1832. At the beginning of the civil war he was made commander and took part in the actions of Belmont, fort Henry, Island No. 10, and several of less importance. He became capt. in 1866; was with the European squadron the next year, and in 1870 was made a commodore.

STENCILING, a method of printing letters or designs. The process consists in cutting out the pattern in a thin plate, usually of metal; this is then laid on the surface intended to receive it, and the color is rubbed into the cut space with a brush, the plate preventing the contact of the color, except on the space cut out. It is much used for wall and other surface-decoration, as it is a rapid and cheap process.

STENDAL, a t. of Prussia, province of Saxony, situated on the river Uchte, 36 m. n.n.e. of Magdeburg. Pop. '95 (with garrison), 20,666. It has a fine late Gothic cathedral, erected in 1423-50. It carries on important manufactures of woollens, cottons, tapestries, sugar, starch, etc. Stendal was formerly the capital of the *Altmark* of Brandenburg.

STENDHAL. See BEYLE, MARIE HENRI.

STENO, NICOLAUS, 1638-87; b. Copenhagen; d. Schwerin. He had long been famed for his anatomical discoveries, when in 1667 he devoted himself to geology, acquiring the right to be regarded as the father of palæontological science. He lived much in Italy and became a Rom. Catholic. In his latest years he wrote several religious and controversial works, and was made a bishop *in partibus* by the pope. See *Nature*, vol. xxv.

STENOGRAPHY. See SHORTHAND.

STEPHAN, HEINRICH VON, b. Pomerania, 1831; entered the Prussian postal service in 1848 and was rapidly promoted until in 1875 he became postmaster-general of the German empire. He introduced many reforms, and brought about postal treaties with foreign countries which have facilitated intercommunication and traffic. He has published *Geschichte der preussischen Post* (1859); and *Das heutige Aegypten* (1872). D. 1897.

STEPHANOCYPHUS MIRABILIS, a remarkable hydrozoön described by Prof. Allman, and for which he has founded a new order of *coelenterata*, the *comedusæ* (see *coelenterata* in article INVERTEBRATE ANIMALS). This organism is always associated with a species of sponge. It consists of a combination of chitinous tubes permeating the sponge, and opening on its surface by large orifices or oscula.

STEPHEN, the name of ten popes of the Roman Catholic church. It is only necessary to refer in detail to the following. **STEPHEN I.** was the successor of Lucius III.

in 254, and his pontificate (254–257) is memorable as affording a topic for the historians who discuss the question as to the early evidences of a Roman *primacy*. The history of Stephen I. is urged as an argument by each party in support of its own view. The advocates of the primacy infer, from several examples of the deposition of bishops by Stephen in various places, that a power equivalent to the modern primacy of Rome was even then acknowledged. The adversaries of the primacy contend that the resistance offered to Stephen by Cyprian (q.v.), on the rebaptizing of heretics, is altogether irreconcilable with the general recognition in the 3d c. of any supremacy on the part of the bishops of Rome.—STEPHEN III. plays a most important part in the history of the temporal sovereignty of the Roman see. He was a native of Rome, and was in possession of the see during the occupation (which practically dates from the year 752) of Ravenna, the exarchate, and the Pentapolis by Astolphus, king of the Lombards. That king having invaded Rome, and the Byzantine emperor, Constantine Copronymos, having left unheeded the appeals of Stephen, and the Romans for succor, Stephen had recourse to Pepin, king of the Franks. The latter in vain sent legates to Astolphus, and the pope returned to France with the legates to solicit in person the aid of the Frank monarch, whom he solemnly crowned. Pepin agreed to compel the Lombards to withdraw from these provinces (which form the portion of the states lately in occupation of the Roman see known as the “Legations”), and to bestow them on the see of Peter. The Lombard king made a promise to that effect; but on Pepin’s withdrawal, again renewed his pretensions, and marched upon Rome. Stephen, therefore, again recalled Pepin in a most curious letter written in the name and person of St. Peter, an invitation with which Pepin at once complied; and having again forced Astolphus to withdraw, he again (notwithstanding a demand from the Byzantine emperor for their restoration to the empire) reinstated the Roman see in its sovereign rights. Stephen died in 757.—STEPHEN VI., elected in 896, has supplied to historians much matter of discussion, from his strange proceedings in disinterring the corpse of his penultimate predecessor, Formosus, stripping it of its pontifical garments, and condemning it, after a juridical procedure, to lay burial. The circumstances of this curious conflict are not fully understood.—STEPHEN X. was one of the remarkable series of reforming popes in the 11th c., who are believed to have been elected under the influence of the celebrated Hildebrand, and who by their energetic rule, prepared the way for that great scheme of ecclesiastical organization of which the pontificate of that eminent man, under the name of Gregory VII. (q.v.), was the final development. It ought to be observed that, although in the series of the popes (q.v.) printed in this *Encyclopædia* ten pontiffs named Stephen are recited, other catalogues reckon but nine; the discrepancy arising from the omission by some of Stephen II., who was elected in 752. This pontiff died before consecration, and is therefore by some excluded from the series of popes; but, as his election was complete and canonical, we have included his name in our general catalogue.

STEPHEN, SAINT, THE DEACON, called also the proto-martyr, or earliest of the Christian martyrs, was one of the seven deacons whose appointment is related in the 6th chapter of the Acts of the Apostles. The circumstances of his martyrdom are related in the same chapter. His festival is fixed during the festivals which accompany that of Christmas. It is kept with great solemnity, both in the east and in the west. His relics were believed to have been discovered in the beginning of the 5th c., the “discovery” being commemorated by a festival held on the 3d of August.—In the calendar of the Roman Catholic church are several other saints of the same name, of whom perhaps the most remarkable is Stephen, king of Hungary, in the early part of the 11th century. He died in 1038. His memory is held in great veneration throughout Southern Germany, and churches are met everywhere, dedicated to his name.

STEPHEN, King of England, was the third son of Stephen, count of Blois, by Adèle or Alise, daughter of William the Conqueror, and was consequently nephew of Henry I., and cousin of Matilda, daughter of Henry. He was born in 1105, brought over to England at an early age, and became a favorite with his uncle, who bestowed on him large estates, both in that country and in Normandy, and procured for him a marriage with Mahout, or Matilda, daughter of Eustace, third count of Boulogne, and younger brother of the famous Godfrey of Bouillon. By this marriage Stephen not only inherited the earldom of Boulogne on the death of his father-in-law (1125), but also became related to the royal family of Scotland, for his wife’s mother, Maria, was a daughter of Malcolm Canmore. When his uncle Henry resolved to settle the crown on his daughter Matilda, whose first husband was Henry V., emperor of Germany (whence she is often spoken of as the “Empress Maud”), he naturally relied on his project receiving the support of his nephew; and at a council held in London, Jan., 1127, Stephen, along with all the other dignitaries of the land, lay and ecclesiastical, took the oath of fealty to Maud. A few months later, the widowed empress married Geoffrey Plantagenet (q.v.). On the death of Henry I. (Dec. 1, 1135), Stephen, knowing well the temper and wish of the English people, hurried over to England from Normandy, where he had been in attendance on his dying uncle, and before the year was out had got himself surrounded by a powerful body of the nobles and clergy and crowned at Westminster. His usurpation of the throne was confirmed by a bull of pope Innocent. But Stephen was doomed to find his crown a crown of thorns. Although a gallant, generous, handsome prince, immeasurably su-

perior in personal and royal virtues to Maud (who was suspected of having murdered her first husband, who quarrelled with her second, and was altogether a fiery, insolent, unwise, and exasperating female): yet it must not be forgotten that on Stephen rests the responsibility of causing a civil war as sanguinary, if not as protracted, as the famous *Wars of the Roses*. Listen to the *Saxon Chronicle*: "In this king's time, all was dissension and evil and rapine. . . . Thou mightest go a whole day's journey, and not find a man sitting in a town, nor an acre of land tilled. The poor died of hunger, and those who had been men well-to-do begged for bread. Never was more mischief done by heathen invaders. . . . To till the ground was to plough the sands of the sea. This lasted the nineteen years that Stephen was king, and it grew continually worse."

We have not space to narrate in detail the struggle of these nineteen years. It is enough to say, that in Feb. 1141, after five years of the hardest fighting imaginable—against David of Scotland, uncle of Maud, who had taken up arms for his niece (see STANDARD, BATTLE OF THE); against Robert, earl of Gloucester, natural son of the late king Henry, who had also raised the standard of his half-sister, against individual nobles who simply wished to live in anarchy and barbarous independence, and finally, against the power of the church, which he vainly sought to diminish—he was taken prisoner by the earl of Gloucester, and placed in chains in the castle of Bristol. Maud was now elected queen by her own party, but her rapacity and other bad qualities soon made her rule intolerable, and the wife of the imprisoned Stephen (also called Maud or Matilda) found it possible to continue the war, by the help of the Londoners, who were staunch adherents of her husband. Stephen obtained his liberty in exchange for the earl of Gloucester, who had fallen into the hands of Stephen's friends at Winchester, and the war was resumed with greater violence than ever. The death of the earl of Gloucester, in 1146, forced Maud to take refuge in Normandy; but a conspiracy of nobles, headed by Ranulph, earl of Chester, and another quarrel with the church kept Stephen's hands as full of work as before, and no sooner were these matters settled, than Maud's son, young prince Henry, appeared in England (1153), at the head of an army to support his claim to the throne. Fortunately for the nation, so sadly wasted and desolated, a compromise was effected between the two rivals, which saved the necessity of further bloodshed—Stephen agreeing to acknowledge Henry as his successor. Stephen died at Dover the year after (Oct. 25, 1154).

STEPHEN, Sir JAMES FITZ-JAMES, b. London, 1829; eldest son of James and bro. of Leslie. He graduated at Cambridge, 1852; and was called to the bar at the Inner Temple, 1854. He was recorder of Newark-on-Trent, 1859-69, and legal member of the council of the gov.-gen. of India, 1869-72, doing much, during his three years in India, to consolidate, abbreviate, and simplify Indian law. He was appointed prof. of common law to the Inns of Court, 1875; in 1877 was nominated knight commander of the Star of India, and judge of the high court of justice, 1879. He published *A General View of the Criminal Law of England* (1863); *Liberty, Equality and Fraternity* (1873); *Digest of the Law of Evidence*, and *Digest of the Criminal Law* (1877); and *A History of the Criminal Law of England* (3 vols., 1883). He died in 1894.

STEPHEN, LESLIE, b. Kensington, Eng., 1832; son of Sir James. He graduated at Trinity Hall, Cambridge, 1852, and was for some years fellow and tutor of his college, removing, 1864, to London, and engaging in literary pursuits. He was a frequent contributor to the *Saturday Review* and other periodicals; edited the *Cornhill Magazine*, 1871-82; and has published the following works: *Hours in a Library*, 3 vols., 1874-76-79; *Essays on Free-thinking and Plain-speaking*, 1873; *History of English Thought in the Eighteenth Century*, 1876; *The Science of Ethics*, 1882; and *Johnson, Pope, and Swift*, in the *English Men of Letters* series. He is also the editor of *The Dictionary of National Biography*, the first volume of which appeared 1885, and the fifty-second in 1897. Stephen is known as one of the leaders of the modern school of agnostics, but he is remarkable less for originality than for the clear vigorous manner in which he presents the accepted doctrines of his school. As a literary critic he is able and impartial.

STEPHENS, a co. in n. Texas, drained by the Clear Fork of Brazos river; 900 sq. m.; pop. '90, 4926. Co. seat, Breckenridge.

STEPHENS (Fr. *Estienne*). The family of the celebrated printers and publishers of this name (descended from a noble Provençal family) is found settled at Paris toward 1500 in the person of Henry Stephens, supposed to have been born about 1460, and died in 1520. In Paris Henry carried on the business of printer and book-seller for upward of 20 years. In 1526 Robert, his second son, b. 1503, is found in possession of the business. Every year of Robert's life is marked by the issue from his printing-press of several volumes, many of them masterpieces of art, and all of them surpassing anything of the kind previously seen in France. He was at once printer, publisher, commentator, and author. Though prosperous, he showed unmistakably that truth—or that which to him was truth—was of more value in his eyes than worldly gain. Having secretly become a convert to the doctrines of the reformation, he endeavored for some time to reconcile his convictions with the outward demeanor required by his position. But the convictions were too strong, or the nature of the man too truth-loving. His Bible of 1545, and his Greek Testament of 1549, each drew down upon him a public prosecution; and though the prosecutions failed legally, they were disastrous to his private fortune. Having first sent his family to Geneva, he followed them there in 1551. Robert, his second son,

shortly afterward returned to Paris, where he resumed his father's business, returning to the Roman Catholic church.

In flying from Paris to Geneva, the Stephens family found that they had but exchanged Roman Catholic for Protestant persecution.

Henry the second, born at Paris in 1528, and succeeding his father Robert on his death in 1559, was repeatedly called before the council, reprimanded, ordered to print cancels, and excommunicated. Though Henry possessed the same literary industry and ability as his father, he was unfortunately deficient in his father's practical turn of mind. Devoted to his art and to his calling, he seems to have been utterly wanting in worldly prudence. In two years we find that he had revised and published more than 4,000 pages of Greek text; while at the same time he was writing his *Apologia pro Herodoto*, a work of formidable length and learning. Rendered nervous and irritable by an overworked brain, and by pecuniary difficulties, which were gathering fast around him, the petty surveillance and censorship of the pious pastors of Geneva became intolerable to him. Traveling, originally undertaken from literary curiosity, grew into a necessity of life. In 1578 he visited Paris, where for several years he became a hanger-on of the court of Henry III., who bestowed upon him a pension, which the state of the royal exchequer rendered merely a nominal one. Quitting Paris, he wandered in poverty over Europe, his own family often ignorant of where he was to be found. He died at Lyons in 1598. Great as a publisher and commentator, Henry Stephens does not seem to have possessed much power as an original thinker. His mastery of Greek seems to have been almost complete, and as a critic of the French language he is still esteemed in France. See *Caractères et Portraits Littéraires du Siècle XVI.*, by M. Leon Feugere (Paris, 1864); also article in *Quarterly Review* (Lond. April, 1865); and article "Estienne," in the *Nouvelle Biographie Générale*; Bernard, *Les Estiennes*; Renouard, *L'Imprimerie des Estiennes*.

STEPHENS, ALEXANDER HAMILTON, LL.D., b. Ga., 1812; graduated at Franklin college, Athens, Ga., in 1832, at the head of his class. He studied law, and was admitted to practice at the bar in 1833, in Crawfordsville, in his native county. In 1836 he was elected a member of the lower house of the Georgia legislature, in which he served five years. In 1842 he was elected to the state senate; and the following year to congress, as a whig, retaining his seat until 1859, when he resigned. After the Kansas struggle in congress he became a democrat, and supported the Lecompton constitution in 1858. On the outbreak of secession in the south, Mr. Stephens opposed it, defending the union in a number of public speeches. He, however, changed his attitude when it was evident that opposition was unavailing; was elected to the vice-presidency of the new confederacy, and delivered addresses at Atlanta and Savannah, Ga., in which he earnestly attacked the north, and sustained the new government in the south. He was one of those among the confederate leaders who boldly asserted the right of slavery *per se*; and who conceded that the southern design was to found a government upon the specific declaration of that principle. Mr. Stephens was a consistent follower of the doctrines of Mr. Calhoun; and his early opposition to secession was doubtless based upon his disbelief in its possibility of success, and his judgment against the policy of the movement. He continued to hold his office during the civil war. In May, 1865, after the surrender of Gen. Lee, he was arrested and imprisoned in Fort Warren, Boston harbor, but was released in Oct. After the war Mr. Stephens repeatedly represented his state in congress, where, though in infirm health, his advice was frequently sought on important measures. He published *A Constitutional View of the Late War Between the States*, and a *Compendium of the History of the U. S.*; inaugurated gov. Georgia, 1882; d. March 4, 1883.

STEPHENS, ANN SOPHIA (WINTERBOTHAM), b. Derby, Conn., 1813; married Edward Stephens, a printer of Plymouth, Mass., and removed to Portland, Me. She established *The Portland Magazine*, 1835; editor of *The Portland Sketch Book*, 1836. In 1837 she removed to New York, contributed to the magazines, and wrote a prize story, *Mary Derwent*, receiving \$400. This brought her into notice, and she at once became a popular magazine writer. She also wrote many novels: *Fashion and Flame* (1854), translated into French; *The Old Homestead*; *The Heiress of Greenhurst*; *Married in Haste*, etc., and edited several magazines and newspapers. D. 1886.

STEPHENS, JOHN LLOYD, 1805-52; b. N. J., graduated at Columbia college, 1822. He studied law in the Litchfield school, and was admitted to the New York bar, where he practiced 8 years. In politics he was an influential democrat. In 1834 he visited Europe and Egypt, and on his return published an account of his travels in the eastern and northern countries. In 1839 he was sent to Central America as special ambassador, and in 1842 again visited Yucatan. His *Incidents of Travel* in these countries form the best of all his popular and valuable works, and contain much original information in regard to American antiquities. He was a director of the "Ocean Steam Navigation company," originating the first American line of transatlantic steamships, and was president of the Panama railroad.

STEPHENS, WILLIAM, 1671-1753; b. England; graduated at King's college, Cambridge; studied law at Middle temple; was a member of parliament, 1696-1722; removed to Charleston, S. C., 1730; at the recommendation of Oglethorpe was appointed secretary of the trustees in Georgia; president of the colony, 1743-50. His *Journal of the*

Proceedings in Georgia was printed in 3 volumes. His son wrote his biography, entitled *The Castle Builders*.

STEPHENSON, a co. in n. Illinois, adjoining Wisconsin, drained by the Pecatonica and the Yellow rivers; traversed by the Chicago and Northwestern, the Chicago, Milwaukee, and St. Paul, and the Illinois Central railroads; about 560 sq. m.; pop. '90, 31,338, chiefly of American birth. The surface is rolling. The soil is fertile. The principal productions are corn, wheat, oats, rye, butter, and wool. Co. seat, Freeport.

STEPHENSON, GEORGE, was born on June 9, 1781, in circumstances of great poverty, his father having to maintain a family of six children on 12s. per week, earned by tending a colliery engine at Wylam, near Newcastle. George's first employment was herding cows at 2d. per day, from which he was promoted to hoeing turnips at 4d.; subsequently, he was appointed fireman at Midmill colliery, and at 15 we find him rejoicing on his salary being raised to 12s. a week. As fireman, he applied himself to diligent study of the steam-engine, taking his machine to pieces during his leisure hours, and thus gaining a thorough practical knowledge of it. At Black Callerton colliery, in 1801, by dint of mending shoes and cleaning watches, in addition to his regular employment, Stephenson contrived to save his first guinea. At 21 he had saved as much as enabled him to furnish a cottage in a humble way, and on Nov. 28, 1802, he was married to a young woman named Fanny Henderson. She died in 1804, while her husband was brakesman at Killingworth colliery. The early life of Stephenson presents a record, whose interest cannot be surpassed, of a contest between determined purpose, industry, and sagacity on the one hand, against poverty on the other. Slowly, inch by inch, we find the inward forces gaining ground upon the outward. Out of his humble gains he contrived to pay 4d. a week for lessons in reading, writing, and arithmetic, which were conned over at night, and mastered by the light of his engine-fire. On one occasion, indeed, so hard had the tide gone against him, that even he had nearly given way to despair. "I wept bitterly," he says, in allusion to an intention he had formed of emigrating—"for I knew not where my lot in life might be cast." In 1815 the invention of a colliery safety-lamp, the "Geordie," brought his name before the public. The fact of his invention being almost simultaneous with that of sir H. Davy, gave rise to a long controversy between their respective friends and supporters. In 1819 Stephenson married his second wife, Elizabeth Hindmarsh, the daughter of a farmer at Black Callerton. It was at Killingworth colliery that he constructed his first locomotive. At first, it was not very efficient; but, subsequently, the grand improvement of the "steam-blast" carried his experiment to a triumphant issue. Further improvements followed, and in 1821 Stephenson was appointed engineer for the construction of the Stockton and Darlington railway; the line on its completion, being partially worked by means of his great invention. The rapid growth of the trade of South Lancashire, together with the unpopular management of the Bridgewater canal, gave rise, in 1821, to the project of a railway between Liverpool and Manchester. Stephenson was chosen engineer. That he proposed to work the line with an engine which was to go at the rate of 12 m. an hour, was a fact held up as of itself sufficient to stamp the project as a bubble. "Twelve miles an hour!" exclaimed the *Quarterly Review*—"as well trust one's self to be fired off on a Congreve rocket."

When the bill ultimately passed, on Mar. 16, 1825, Stephenson was appointed principal engineer, with a salary of £1000 a year. After inconceivable difficulties, the line was completed in 1829. There then ensued the memorable competition of engines, resulting in the complete triumph of Mr. Stephenson's "Rocket," which, to the astonishment of every one except himself, was found capable of traveling at the till then undreamt-of rate of 35 m. an hour. "Now," exclaimed one of the directors, "George Stephenson has at last delivered himself." While occupied in carrying out the vast system of railway which soon overspread the country, Stephenson's home was at Alton Grange, near Leicester. He saw but little of it, however, as he was often traveling on business for weeks at a time. During the three years ending 1837, he was principal engineer on the North Midland, York and North Midland, Manchester and Leeds, Birmingham and Derby, and Sheffield and Rotherham railways. In 1836 alone, 214 m. of railway were put under his direction, involving a capital of five millions. In the autumn of 1845 he visited Belgium and Spain for professional purposes. On his way home he was seized with pleurisy, from which attack he does not seem ever to have thoroughly recovered. He occupied his declining years with the quiet pursuits of a country gentleman, indulging his love of nature, which, through all his busy life, had never left him. He died at his country-seat of Taptop, Aug. 12, 1848. The leading feature of his mind was honesty of purpose, and determination in carrying it out. "I have fought for the locomotive single-handed for nearly 20 years," he says; "I put up with every rebuff, determined not to be put down." Toward trickery and affectation he never concealed his contempt, while honest merit never appealed to his liberality in vain.—See *Lives of Engineers*, by Samuel Smiles, vol. iii. (Lond. 1862).

STEPHENSON, ROBERT, only son of George Stephenson, was b. on Oct. 16, 1803. When a boy he attended a school in Newcastle. In 1820 his father's improving circumstances enabled him to send Robert to the university of Edinburgh, where he seems to have made excellent use of his time. In 1823 we find him assisting his father in the survey for the Stockton and Darlington railway. Subsequently, he took an active part

in the locomotive engine-works started by his father at Newcastle. In June, 1824, he went to Mariquita, in South America, on an engineering appointment; but this not suiting him, at the end of three years he returned home by the United States and Canada. He then assumed the management of the Newcastle business. During the discussion as to the power to be employed on the Liverpool and Manchester line, he was in constant communication with his father, to whom his quick perception and rapid judgment were of great assistance. Shortly after the completion of this line, he was appointed engineer of the Leicester and Swannington railway. Subsequently he was appointed joint managing engineer, along with his father, of the London and Birmingham line, the execution of which immense work was ultimately almost wholly intrusted to him. In 1829 he married Frances, daughter of John Sanderson, merchant in London. She died in 1842 without issue; and he did not marry again. The London and Birmingham line was completed in such a manner as to raise Stephenson to the very highest rank in his profession. Business now flowed in upon him. In one parliamentary session we find him engaged in 33 new schemes. Projectors thought themselves fortunate if they could procure his services on any terms. The work which he got through was enormous, and his gains large beyond what had then been known in his profession.

The Britannia tubular bridge, of which undertaking Robert Stephenson was the master spirit, is one of the most remarkable monuments of the enterprise and engineering skill of the present century. It was completed on Mar. 5, 1850, at a cost of £234,450. Stephenson lived to repeat his splendid achievement in the bridge across the St. Lawrence at Montreal, and in the two bridges across the Nile at Damietta. In 1847 he was returned to the house of commons as member for Whitby. On Aug. 15, 1849, he completed the high-level bridge at Newcastle, and in the following year the great viaduct across the Tweed at Berwick. In 1855 the emperor of the French decorated him with the legion of honor. At home the university of Oxford made him D.C.L. In the same year he was elected president of the institute of civil engineers. The immense amount of work which he went through both at home and abroad proved too much for his constitution, originally delicate; while in Norway, in 1859, he was seized by the illness which soon afterward ended his illustrious career. He died on Oct. 12, 1859. He was buried in Westminster abbey. It was as a workman that Robert Stephenson was great, his political views being at times rather narrow. Contrasting him with his great rival, Brunel, it has been said that the ambition of the latter was to make a great work; that of the former to make a work which would *pay*. Robert Stephenson inherited the kindly spirit and benevolent disposition of his father.

STEPNIAK, the pseudonym of MICHAEL DRAGOMANOF, born Gadiatch in Little Russia, 1841; studied at the gymnasium of Poltava and at the univ. of Kiev; in 1864 was appointed prof. of ancient history in the latter place, but his radical ideas led to his expulsion in 1876. He then went to Geneva and undertook the publication of the Ukraine review *Gromada*, in which he advocated the adoption of a federal government for Russia. At the same time he contributed articles on Russian subjects to various European periodicals, and issued a number of historical pamphlets. In 1882 his *Underground Russia* appeared in Italy and in the Italian language under his now famous pseudonym, followed in 1885 by *Russia under the Czars*. These books give a vivid insight into the political condition of the Russian empire, and especially of the machinations of the Nihilists. Their wide popularity led to many attempts to penetrate the secret of their authorship, but it was not till 1885 that the identity of Stepnjak was established. In 1891 he visited the United States. D. 1896.

STEPPEs, the distinctive name applied to those extensive plains which, with the occasional interpolation of low ranges of hills, stretch from the Dnieper across the s.e. of European Russia, round the shores of the Caspian and Aral seas, between the Altai and Ural chains, and occupy the low lands of Siberia. The word, which is of Russian origin, denotes primarily an uncultivated plain of great extent, and has been applied by geographers to the above-mentioned regions as expressive of their flat, semi-barren, treeless character. In spring and early summer the steppes are clad with a thin covering of green herbage, become parched and barren under the scorching heat and drought of June, and in winter are hid beneath a thick covering of snow, which, raised in huge white thin clouds, and driven hither and thither by furious storms, brings destruction to every living creature within its sweep. The monotony of the steppe is as fatiguing to the traveler as is that of the sandy, arid desert. For hundreds of leagues his eye is compelled to endure the same unvarying level of scanty herbage, unbroken by tree or bush, and bounded by the utmost limits of the horizon; only in spring, while the vegetation is succulent and fitted for pasture, is the solitude broken here and there by herds of horses and cattle and their mounted guardians. In autumn, when the tall herbage, withered by the heats of summer, has been rooted up and broken by violent winds, it becomes gathered and rolled together into enormous balls, sometimes of from 9 to 11 yards in diameter. Here and there are tracts which offer some inducement to the agriculturist; such are the steppe e. of the Dnieper, that between the Don and Volga—of inferior fertility, but rich in coal—and the steppes of south-western Siberia, especially those in the government of Tomsk, all of which have been partially colonized; but a very wide extent is hopelessly barren.

STERCULIA CEE, a natural order of exogenous plants, closely allied to *malvaceæ* and *hytneriaceæ*, and consisting of large trees and shrubs, natives of warm climates. About 130 species are known. The flowers of some are irregular, and in some they are hermaphrodite, in others unisexual. Many species, particularly of the sub-order *bombaceæ*, are trees of gigantic size, among which is the baobab or *adansonia* (q.v.) *digitata*. The bark of some species is very fibrous, so that it is made into ropes and coarse cloth. The light wood of *ochromalagopus* is used in the West Indies instead of cork.

STERE (Gr. *stereos*, solid), the name given to the unit of cubic measure in the French metrical system. It is a cubic meter (q.v.), and equivalent to 35.3165818168 English cubic ft., or 1.3080215487 English cubic yards. The *decastère* is equal to 10 steres, and the *decistère* to the tenth part of a stere. This measure is much used for wood, especially firewood.

STERELMINTHA (Gr. *stereos*, solid, and *helmins*, an intestinal worm), a term suggested by Prof. Owen, and generally adopted to signify those intestinal worms which have no true abdominal cavity, and which were called "parenchymatous" by Cuvier. See **CELELMINTHA**.

STEREOCHROMY, a process of wall-painting, invented by Prof. J. N. von Fuchs, of Munich, professed to be superior to fresco-painting, inasmuch as it will admit of any part of the picture being retouched, as in the case of oil-paintings. It is also more durable, being protected by a varnish from the effects of the atmosphere.

STEREOSCOPE (Gr. *stereos*, solid, and *skopein*, to see), an optical instrument of modern invention, by means of which pictures of objects possessing three dimensions are seen not as plane representations, but with an appearance of solidity or relief, as in ordinary vision of the objects themselves. The more recondite principles of the stereoscope, which are of high interest and importance in their bearing on the philosophy of perception, will be fully considered under **VISION**, **BINOCULAR**. The present article will be limited to an historical sketch of its invention and subsequent developments, coupled with an exposition of the optical and mechanical details of its construction.

The essential principle of the stereoscope, the first conception of which by prof. Wheatstone justly ranks as one of the most brilliant optical discoveries of the age, may be thus explained. It is an obvious fact that the eyes being separated by a certain interval of space, all solid objects so near to the observer as to be seen with a sensible convergence of the optic axis, necessarily form retinal pictures, differing as to their perspective projections for each eye. Singular to say, the true import of this plain fact was wholly unsuspected prior to the investigations of Prof. Wheatstone, who, in his first paper on this subject, published in the *Philosophical Transactions* for 1838, clearly established the important conclusion that this dissimilarity of the retinal images is made to subserve an important end in the use of our visual organs—that it is, in fact, the principal originating cause of our immediate perception of the solidity (or relief) of objects adjacent to the sight. The problem he set himself to investigate was: "What would be the visual effect of simultaneously presenting to each eye, instead of the object itself, its projection on a plane surface as it appears to that eye?" and in order to bring this question to the test of experiment, he devised an instrument which he named the stereoscope.

The pictures being attached to the slides, the observer places himself with his nose close to and immediately in front of the vertical angle made by the reflectors, so that the view by each eye is limited to the rays reflected by its appropriate mirror; the pictures are then seen, as it were, behind the mirrors, and, the eyes being made slightly to converge, either by an effort of the will or by drawing the slides a little forward, the effect of either of which is to refer the reflected images to the same part of space, the observer sees no longer mere pictorial resemblances, but, to all appearance, the objects themselves, exquisitely modeled, occupying a certain extent of space, and standing forth with a substantiality of aspect truly wonderful. At the outset the only stereoscopic pictures obtainable were the outlines of geometrical solid figures, which it was possible for a skillful artist to depict with perspective projections adapted for the right and left eye respectively; and the pictures so prepared excited the greatest interest and admiration. They, moreover, abundantly exemplified the truth and importance of the binocular principle, though the universality of its application to purposes of pictorial illustration only became apparent on the introduction and gradual improvement of the photographic arts. In 1849 sir David Brewster originated that convenient, portable, and in all respects admirable form of the stereoscope which is now in general use over the whole civilized world. For this—the lenticular stereoscope—the pictures (taken, be it remembered, from two different points of view), are mounted side by side, on a piece of cardboard, and, being placed in the instrument, are viewed through semi-lenses, fixed at a distance apart of the two eyes. To effect the displacement of the pictures, so that they shall be referred to the same part of space, which we have above defined to be an essential condition, sir David Brewster most ingeniously availed himself of an optical principle, which enabled him at the same time to fulfill several collateral ends of considerable importance. This principle may be described as follows: If an object be viewed through the center, or, more properly, along the axis, of a convex lens, it will be seen exactly in front of the eye; i.e., in a line with the eye, the center of the lens, and the actual place of the object. If now the lens be moved slightly to the left, the

object will appear to advance toward the right; and, conversely, as the lens is moved toward the right, the object is displaced in the opposite direction. Let the lens be cut in half, transversely, and the two semi-circular pieces reversed as to their former position, i.e., placed side by side, and so that their thin edges shall be adjacent, while the two plane edges, formed by the section of the lens, are kept in mutual parallelism, and have their faces turned outward, toward the left and right respectively: the right eye will now look through the left half of the lens, and *vice versa*; and the two pictures, each placed opposite its appropriate eye, and in the principal focus of the eye-piece, will be seen, not in their actual places, but in a position midway between the two. The subsidiary purposes served by this arrangement are that the pictures are magnified as well as caused to coalesce; and that the equality of the magnifying power of the eye-pieces (a result by no other means certainly attainable) is secured by the fact of their being cut from the same lens, the whole of which is thus advantageously and economically utilized. In too many of the instruments offered for sale the conditions stated above are very imperfectly fulfilled; the parallelism of the two sectional planes of the semi-lenses, and their rectangularity with two imaginary planes joining their opposite ends respectively, are not maintained, and, as a consequence, the coalescence of the pictures is effected, if at all, by a forced and more or less painful displacement of the eyeballs, entirely destructive of all pleasure in the use of the instrument. And it is important to recollect that this parallelism of the sides of the semi-lenses may be either actual or virtual; for to whatever shape they may be cut (and the circular form is the one most often adopted), the foregoing conditions are in nowise altered. The best lenticular form of the instrument with which we are acquainted is the achromatic stereoscope devised by Messrs. Smith, Beck, and Beck, the well-known London opticians, which combines excellencies of a very varied character.

It remains to speak of the pictures in their relation the one to the other as a stereoscopic pair. Evidently, exactly to reproduce the conditions of normal vision, they should be taken from points of view separated laterally by a space equal to the distance between the eyes, viz., about $2\frac{1}{2}$ in.; and for all objects within narrow limits of distance this rule is observed. But taking a wider range, such as would include, for instance, an extensive architectural pile, photographers usually take their pictures from spots separated by a considerable interval; and the stereoscopic slides thus obtained, when viewed in the stereoscope, exhibit effects of solidity or relief of a very striking character. Inasmuch, however, as these effects are due to a gross exaggeration of the ordinary difference of perspective relatively to the two eyes, they to a like extent misrepresent the actual appearance of the scene; and it were to be wished that for all stereoscopic pairs alike, whether representative of near or of remote objects, photographers would be content to adopt that exact relation of the two retinal pictures which subsists in ordinary binocular vision. As to the mounting of the pictures, it is of course highly important that they be placed exactly in the same line; it has further been pointed out by Mr. Claudet that, as the apparent solidity of the objects viewed in the stereoscope conflicts with the evident flatness of the cardboard mount, it is advantageous to adopt the following expedient. The pictures must be of the same size, but instead of having them identically the same as regards the objects represented on each, let the left-hand picture include on its left-hand margin somewhat less than is found on the same margin of the right-hand picture; similarly, let its right-hand margin contain somewhat more than is found on the same margin of the right-hand picture: then will the view appear to extend well out of and beyond the cardboard, which forms, as it were, a framework around it. A moment's consideration will show that this ingenious arrangement does but reproduce the conditions which obtain whenever we look out upon a scene through a casement distant from us by a few feet. Availing himself of the libration of the moon, Mr. Warren De La Rue has obtained lunar stereoscopic photographs, which exhibit that body with a general appearance of rotundity, while the other objects on her surface are seen in conspicuous relief. These effects are, however, evidently due to an exaggeration of the "binocular parallax;" for by no human eyes, how near soever they might be placed to the lunar surface, could such a view be obtained. It is, as sir John Herschel has remarked, as though the moon were seen with the eyes of a giant, placed thousands of miles apart.

Among the minor applications of the stereoscope may be mentioned the STEREOMONOSCOPE and the STEREOTROPE, the former devised by Mr. Claudet, the latter by Mr. William Thomas Shaw; and severally described by them in the *Proceedings of the Royal Society* of June, 1857, April, 1858, and Jan., 1861. In the stereomonoscope, the two pictures of a stereoscopic pair are projected, by means of lenses, on to the posterior surface of a piece of ground glass, one upon the other, or so that they occupy the same place; when the observer, looking from the opposite side of the glass, sees them not as a confused mixture of two pictures, but as a single stereoscopic representation, possessing the usual attributes of solidity or relief. The stereotrope consists in an application of the principle of the stereoscope to that class of instruments variously termed thaumatropes, phenakistoscopes, etc., which depend for their results on "persistence of vision." In these instruments, as is well known, an object represented on a revolving disk in the successive positions it assumes in performing a given evolution, is seen to execute the movement so delineated; in the stereotrope, the effect of solidity is superadded, so that

the object is seen as if in motion, and with an appearance of relief as in nature. A highly ingenious application of the principle of the stereoscope to portraiture has been described by Mr. Henry Swann in the *Report of the British Association for 1863*. In this arrangement, the portrait is seen as a solid bust imbedded in a cube of crystal. A form of the reflecting stereoscope, in which the planes of reflection are vertical, has been proposed by Mr. Walter Hardie. See *ZOETROPE*; Brewster, *The S*.

But by far the most important application of the stereoscopic principle, is its realization in the binocular microscope of Mr. Wenham, the advantages of which over the monocular form of that instrument are increasingly appreciated by microscopists. In this, the right and left eye pictures, respectively, are thus obtained. Immediately behind the object-glass, a small and peculiarly shaped prism is placed in such a position, that it shall receive the whole of the rays coming through the right half of the lens. These rays, after being twice reflected within the body of the prism, finally emerge at such an angle to their original direction, that they cross the undiverted pencil of rays transmitted by the other half of the lens, and are then received into a second tube, which, being inclined to the first or main tube at an appropriate angle, conveys them to the left eye; while the other complement of rays pursues an undeviating course to the right eye. Each of the two tubes is fitted with the usual eye-pieces; and object-glasses of all but the highest powers may be used with pleasure and advantage. For a fuller explanation, see the original paper by Mr. Wenham in the *Transactions of the Microscopic Society*, new series, vol. ix., page 15. See *Helmholtz, Physiol. Optik*; and his *Popular Lectures*.

STEREOTYPING (Gr. *stereos*, fixed, solid), the art of fabricating metal plates resembling pages of type, from which impressions may be taken as in ordinary letter-press printing. The plates, which are composed of type-metal, are about $\frac{3}{16}$ of an inch thick, perfectly smooth on the back, and having a face exactly resembling a page of movable type. To yield an impression, the plates are fastened by a temporary arrangement to blocks of wood—plate and block together being the height of a type, or one inch. Stereotyping is not employed where only a definite and moderate number of impressions of any work are required. Its chief value consists in its availableness for future impressions contingent on the renewed demand for copies; but it is also of importance in duplicating the means of taking large impressions quickly. Considering the small quantity of metal employed in fabricating a stereotype plate, printers are enabled to secure and store up forms of type, so to speak, at a comparatively small outlay, and have at all times the means ready at hand to produce fresh editions without the trouble or cost of setting a single letter. As in the case of many valuable inventions, there has been not a little discussion as to who was the discoverer of the art of stereotyping. By some it has been ascribed to Van der Mey, a Dutch printer, who early in the 18th. c. executed editions of the Bible from forms of fixed type. Van der Mey's process, however, was not stereotyping in the proper sense of the word; for it consisted in nothing more than soldering together all the types in a page in order to fix them permanently. There can be no doubt that the inventor of stereotyping was William Ged, a goldsmith in Edinburgh, who made the discovery about 1725. In 1727 he entered into a contract with a person to prosecute the business of stereotyping; but this person, who had little means, becoming intimidated, the contract was relinquished. In 1729, Ged entered into a partnership for the same object with William Fenner, a London stationer. Afterward, John James, an architect, Thomas James, a type-founder, and James Ged, son of the inventor, joined the partnership. By this association, certain Bibles and prayer-books were stereotyped for the university of Cambridge about 1731. Ged's success was so far complete, but his prospects were blighted by ill-treatment from his partners, as well as by the misconduct of the pressmen employed to print from his plates, which they maliciously damaged and rendered imperfect. The university appears to have at length abandoned the use of the plates, which were sent to Caslon's letter foundry in London to be melted. A few of these plates escaped the crucible, and from two of them, being pages of the Book of Common Prayer, impressions are given in Hansard's *Typographia*, Part II. 1825. Ged's partnership was broken up in 1738, and full of disappointment he returned to Edinburgh. There, he prosecuted his art, and was able to execute several editions of Sallust, of a small size, for the use of schools. Copies of these editions still exist. The earliest which we have seen purports to be printed in 1739, and bears an imprint in Latin which may be translated as follows: "Not executed by movable types, but by tablets of fused metal." The printing is as neatly executed as that of any volume at the period. This Sallust of 1739, as we apprehend, was the first book correctly printed from stereotype plates. To add to the cares of William Ged, his son James engaged in the Jacobite insurrection of 1745, and was taken prisoner, and condemned; his life, however, was spared on account of his father's useful invention, and he proceeded to Jamaica, where William, his brother, was already settled. William Ged, the inventor of stereotyping, died at Edinburgh, Oct. 19, 1749, in very indifferent circumstances.

The art of stereotyping has undergone little change since its discovery by Ged. The process of fabricating plates is very simple. The page of type being set, corrected, cleaned, and fixed in a frame, is laid on a smooth iron table face upward; a little fine oil is brushed over it, to prevent the liquid stucco from adhering; the stucco to the con-

sistency of cream is now poured over the face of the page, and straightened over it in the process of hardening; when hardened, the cake of stucco is lifted off, and is seen to be a perfect mold of the types. The cake is now baked in an oven, and then placed in an iron pan; the pan, which has inlets at the upper side, is plunged into molten metal, which soon runs into the mold; being lifted out and cooled, the pan is opened and found to contain a plate resembling the page of type; the mold is broken and of no further use. When removed from the pan, the plate is rough, and needs to be trimmed for working; for this purpose it passes through the hands of artisans, who prepare it for the press. Should any particular letter be defective, it is dug out, and a corresponding type inserted; the end of which type is cut off at the back of the plate by a soldering bolt. In preparing plates for press, nothing is more important than giving a high degree of level smoothness to the back, and to effect this certain planing and smoothing operations are adopted. Such is the old and well-known *stucco* process of stereotyping. Latterly, there have been divers improvements as regards the shape of the pans, in order to facilitate the fabrication of several plates at once, but the principle is in all cases the same. After the stereotyping is finished, the types are distributed. In some printing-offices, all work whatsoever is executed from plates, and types are employed only to produce molds. This, however, does not save types from deterioration; in cleaning them with brushes and oiling them for the stucco, their finer parts become in no long time rounded off. As regards impressions from stereotype plates, the work is seldom so sharp and fine as from pages of movable letter; but it answers every required purpose in a large variety of cases. Plates properly manufactured, stored, and mended when necessary, will last for repeated impressions to the extent of hundreds of thousands over a long series of years. The stock of plates in some establishments is accordingly large, and represents a considerable sunk capital.

The method of preparation of the stereotype plates used on newspaper printing presses is as follows:

The page forms of type and cuts being lowered from the composing room, each page is at once put upon the molding or beating-table, and covered with fine sheets of a specially prepared paper, then with felt, and passed under a heavy power-driven roller. This forces the paper into every depression of the faces of the types and engravings, making an *intaglio* or "matrix," in which the entire contents of the page can be read from left to right. The form, with its matrix upon it, is then put upon one side of a double steam table, and covered with a thick felt; the platen is brought down with great pressure by a hand-wheel and screw, and held there for about 6 minutes, while the matrix is baked hard at a temperature of about 300° F. After being trimmed square and to size by a knife at the back of the steam table, it is then almost ready for casting; but first any very great depressions in the reverse side of the matrix are generally reinforced with felt backing pieces to enable such places to withstand the pressure of the hot metal. The reinforced matrix constitutes a tough, flexible mold, which is then dusted with French chalk, and next bent around the concave side of a semi-cylindrical casting-box, the outer and inner shells of which are then brought together and clamped firm, so as to leave a space of about half an inch between the face of the matrix and the core of the box. The casting box is balanced upon trunnions and has cold-water circulation, so as to keep it as nearly cool as possible.

The metal furnaces hold from 2500 to 5500 lbs. each of seething molten stereotype metal. Two men with a huge ladle dip out more than enough of the bright, heavy liquid to make a page form, and pouring it with a skillful dash into the casting box, return the ladle, open the clamps, withdraw the hot cast and place it upon the horse of the sawing or cutting-off machine, where it is automatically clamped, and with one hand the operator, with two turns, trims off both ends of the semi-cylindrical cast to exact length and proper bevel. From this machine it is removed and put upon another horse, or finishing cylinder, upon which its sides are planed straight by two men, and any large open spaces cut away to greater depth. It is then dropped into the semi-cylindrical lap of one of the two power-shaving machines, in which a knife sweeps around and reduces the thickness to the standard, leaving the cast with perfect inner surface. Hot as it is, it is rushed to the press-room.

The time employed in stereotyping is about as follows: making the rough matrix from the form, $1\frac{1}{2}$ minutes; under the steam table, 6 minutes; taking cast, $1\frac{1}{2}$ minutes; sawing, 1 minute; routing and side planing, $\frac{1}{2}$ minute; shaving inside, $\frac{1}{2}$ minute; total, $9\frac{1}{2}$ minutes.

The stereotyping department of the N. Y. *World* had (Nov. '89) a capacity to cast and finish 150 page forms per hour. From each supplement matrix there are frequently taken 20 casts, and from each of the main-sheet pages 16, to enable all the presses to run at once upon the last form of the latest edition. Each week-day night there are made about 200 casts, each weighing 80 lbs. gross, or 48 lbs. when finished, making 16,000 lbs. of metal handled. Saturday nights there are required for a 32 page paper 600 plates, weighing, unfinished, 48,000 lbs., or 24 net tons.

As new editions of old newspapers are not wanted, the plates are melted down as soon as the operations of the day are over. Even when books are printed from movable types, it may serve a good purpose to take paper molds from them before distribution; for the molds, on being dried, can be laid aside and be afterward employed for fabricating plates should a new impression be wanted. The author of a book, for example,

could, at a most insignificant addition to the expense of type-setting, possess himself of a set of paper moulds of his work, to be used if necessary at some future period, in order to save the type-composition for a new edition.

STERILIZED FOOD. Food is said to be sterilized when it has been subjected to an agent capable of destroying the germs of fermentation or disease which might be present. The articles of diet not usually treated by heat before ingestion are fresh fruits and certain vegetables, water, and milk. Fresh fruits and vegetables seldom contain any harmful germs, but milk and water are especially favorable media for bacterial development.

Water and Ice.—Water is sterilized by boiling or by distillation. It is then best prepared for table use by putting into sterilized stone bottles, and placing on ice. The addition of ice to drinking water affords an opportunity for the introduction of bacteria into the digestive organs. It has been shown by the researches of Dr. Prudden that the bacilli of various diseases (especially typhoid fever) are not destroyed by freezing, and that certain varieties will retain their vitality even after prolonged imprisonment in ice. Sterilized ice is now manufactured from distilled water.

Sterilized Food.—It has been said that while the adult naturally lives on cooked or sterilized food, the child who does not depend upon the mother's breast, has been left to uncooked, unsterilized food. Milk drawn by the suckling from the mammary gland is practically free from germs; but cow's milk, as offered for sale, at a distance from its source, cannot fail to contain bacteria.

The question of sterilized food becomes then principally the question of sterilized milk.

Milk—Sources of Contamination.—Particles of dirt and manure may fall from the udders during milking, or may come from the dairyman's hands. Impure water used for cleaning cans, even if not used for adulteration, may be the means of contamination. Diseased condition of the animal herself, such as tuberculosis or "foot-and-mouth disease," may furnish germs to the milk. As milk readily absorbs impurities, mere exposure to the air is a possible cause also for contamination. Milk contains the elements of a complete nutrition, and therefore forms a favorable medium for the development of micro-organisms until the reaction becomes changed by the formation of considerable acid. Currier has shown (*milk sterilized*), *N. Y. Med. Rec.*, July 21, 1890, by bacteriological experiment, that milk coming directly from the udder is practically sterile, and that micro-organisms must make their entrance later. A portion of milk was drawn into a sterilized bottle from a healthy cow, whose udder, as well as the dairyman's hands, had been carefully cleansed. A drop was placed on a gelatine plate, which after one week showed no bacteria. The bottle was carefully sealed, and after a week the milk was absolutely unchanged. He then took the same quantity of milk from a grocery shop, receiving it as before into a sterilized bottle, and sealing. In one week this specimen was sour and the caseine had separated. Gelatine plates which three days before had each received a cubic centimetre of this milk, showed a hundred thousand colonies in each.

Bacteria found in Milk.—Jeffries (*Trans. Am. Pediatric Soc.*, 1888-89) has described six varieties of bacteria (in addition to the non-pathogenic *bacillus lactis aerogenes* and *bacterium coli commune* always found in milk fæces whether normal or abnormal), which produce active fermentation in milk. It was found that all the varieties of bacteria found in diarrhœal fæces thrive, and many produce important changes in milk.

- I. Some coagulate milk with acid reaction.
- II. Some render milk acid without coagulation.
- III. Render it alkaline without coagulation.
- IV. Change slightly acid milk into alkaline, and then coagulate it with alkaline reaction.
- V. Causes milk to become a transparent fluid without coagulation.
- VI. Produce above change after first coagulating the milk.

In 1857 Pasteur discovered that the souring of milk was due to the presence of micro-organisms, refuting Liebig's theory that caseine furnished the chemical ferment which caused this change. Since that time there has been constantly increasing evidence also that bacteria that develop in milk can produce ptomaines, which are active poisons. Although but few of the bacteria present in milk affect its nutritive value, still they are not desirable, and if conditions favorable to their activity exist, they may become positively harmful. So sterilization aims to kill all the bacteria in milk which by their development would produce lactic or butyric acid fermentation; besides destroying all other forms which might accidentally be present as the germs of decomposition, supuration, or of specific diseases.

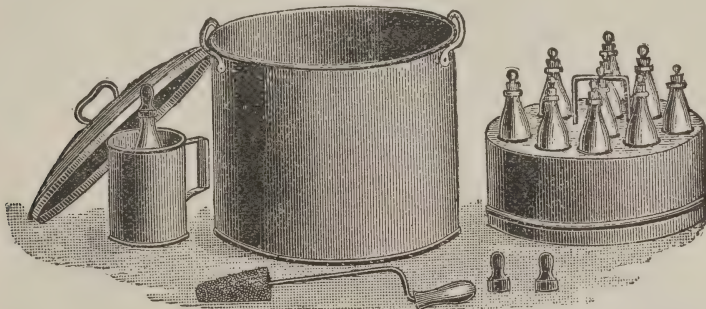
Chemical Sterilizers.—It has been proposed at various times to prevent the development of germs in milk by the addition of harmless antiseptic substances. But it has been found that even with such drugs as salicylic and boric acid, quantities too large to be wholesome must be employed. It has been shown that in milk originally neutral even the feebly vitalized cholera germs remain alive and harmful until the milk has become decidedly acid. Alkaline salts (as well as neutral) favor the activity and increase of bacteria rather than otherwise.

Cold as a Sterilizer.—A low temperature retards development of bacteria for a time, but does not, in some cases, destroy them, even if frozen.

Heat as a Sterilizer.—A temperature of 212° (and in many cases less), maintained for about an hour, can be relied upon to kill all germs. Superheated steam is the most rapidly effective form of the application of heat; boiling water is next; and an even lower degree, 167° F. “*Pasteurization*,” is sufficient for many bacteria. A lower temperature than this will destroy the bacilli of typhoid fever and of cholera; but the tubercle bacillus is more resistant, and requires the full 212° at least twenty minutes.

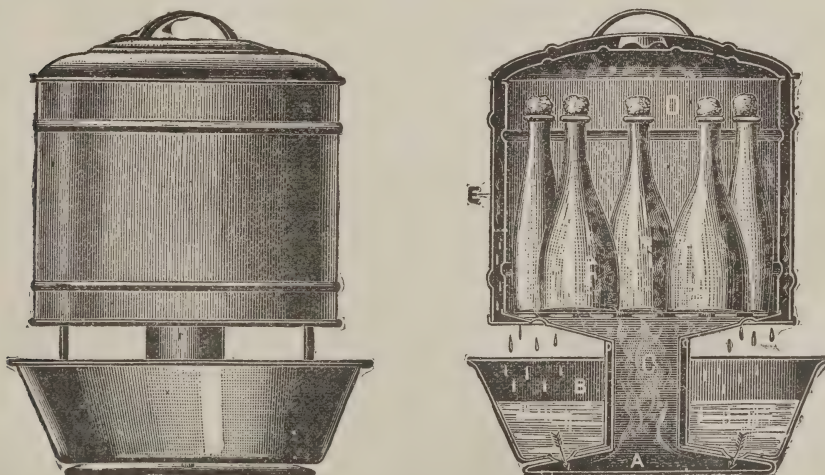
Apparatus for Sterilization of Milk by Heat.—There are three forms of sterilizers in general use—those of Soxhlet, Arnold, and Seibert. Soxhlet's is on the principle of a bath of boiling water; Arnold's, on that of superheated steam. Seibert's sterilizer claims to be on Soxhlet's principle.

a. *Soxhlet's Apparatus*, first described in Nos. 15 and 16 of the *Münchener Medizinische Wochenschrift*, 1886, consists of a tray holding 10 feeding bottles with combination stoppers, and a pot to boil them in; 6 extra bottles, a tin dipper to warm the milk in before feeding, and a brush for cleansing.



“The bottles are filled within one half inch of the neck. Into each bottle a perforated rubber stopper is pressed. The bottles are placed in the tray, which is set in the pot of water. After the water has come to a boil, and expansion has taken place, the glass stoppers are pressed into the perforated rubber stopper, thus hermetically closing each bottle. The milk remains in the boiling water fifteen to twenty minutes longer, and is for that length of time under pressure in a temperature of 212° F. Milk so prepared will keep sweet four to six weeks. When the milk is to be used, the bottle is put into hot water for a few minutes, until the contents are warm. The stopper is then removed and an ordinary nipple attached. Milk remaining in the bottle after the child has been fed is thrown away.”

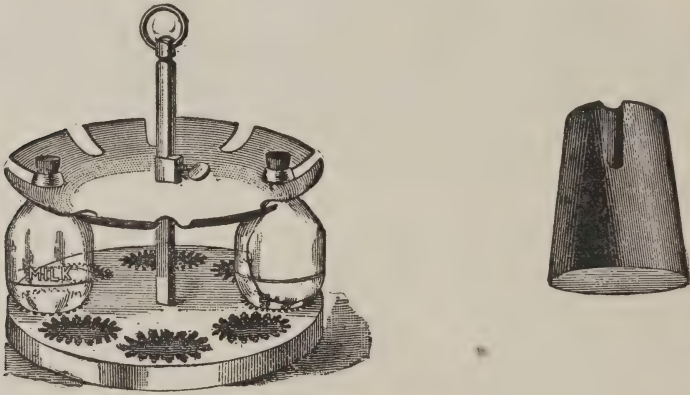
b. *ARNOLD'S STERILIZER* (Cheesman, *N. Y. Med. Rec.*, July 13, 1889) depends upon superheated steam. This form of apparatus is the one most generally used. The bottles, which are made rounded and without necks, having no angles, are stopped with a wad of cotton, and placed upon a rack within the oven.



A. Shallow Copper Steam Generator. B. Reservoir or Pan. C. Steam Funnel. D. Sterilizing Chamber. E. Hood. “Water is poured into the pan or reservoir, whence it passes slowly through three small apertures into the shallow copper vessel beneath,

becomes converted into steam, and rises through the funnel in the centre of the sterilizing chamber above. Here it accumulates under moderate pressure at a temperature of 212° F. The excess of steam escapes about the cover, becomes imprisoned under the hood, and serves to form a steam jacket between the wall of the sterilizing chamber and the hood. As the steam is forced down from above and meets the air, it condenses and drips back into the reservoir. It will generate steam from cold water in three or four minutes on an ordinary fire—coal, gas, or kerosene. The time required for sterilizing milk in the Arnold apparatus is 30 to 45 minutes."

c. SEIBERT'S METHOD was designed to meet the wants of the poorer classes whose means could not compass the Arnold or Soxhlet apparatus. Dr. Seibert (*N. Y. Med. Jour.*, Feb. 15, 1890) devised a tray with bottles of rounded corners, no necks, and so shaped that a lead-pencil will reach any part. This tray can be set into an iron kettle such as is found in any household. The tray is made to fit a pot 10 in. wide and 8 in. high. The bottles are filled partly full of milk up to a mark blown into the glass, which varies according to the age of the child, and are then filled to the top with barley or oatmeal gruel or plain water. The bottles are closed by a rubber stopper having a groove on the side by which steam escapes. This groove does not reach to the top of the cork, so that by giving it a turn on removal the bottle can be completely closed. The tray with the bottles is set into the kettle, which contains 2 teacupfuls of water. The lid is put on and the steaming continues for 30 minutes in cold weather, for 45 in warm.



Effect of Prolonged Heat upon the Ingredients of Milk.—Chapin found that heat applied long enough to sterilize milk produced an appreciable effect upon the caseine, the fat, and the albumen. The caseine coagulates in smaller clots, but still is much tougher and less digestible than human caseine. The fat is collected in larger globules, and may be often noticed in nursing bottles as flakes. The albumen is partially or completely coagulated.—*N. Y. Med. Rec.*, June 21, 1890.

Diseases propagated through Unsterilized Milk.—Typhoid fever, tuberculosis, scarlet fever, cholera, and diseases of the digestive tract (especially the summer diarrhoeas of infancy) are the diseases most likely to have their germs conveyed by milk. With the sterilization of milk came a revolution not only in infant feeding in health, but also in the course, treatment, and fatality of summer diarrhoea of young children. The germs of typhoid fever are supposed to get into milk through water used for adulteration and to rinse the cans. The micro-organisms are very susceptible to heat. The tubercle bacillus may be present in milk, coming from the mammary gland of the cow, or entering through some outside source of contamination. Primary tuberculosis of the digestive tract occurs from ingestion of the tubercle bacillus. This is comparatively rare, but there are cases on record.—*Northrup, Am. Jour. Med. Sc.*, Sept. 1890. *Bang, Copenhagen Congress*, 1884).

The identity of the "foot-and-mouth disease" in cattle, and scarlet fever in the human subject, is still questioned, but the study of a remarkable epidemic in Dover, England, in 1885, certainly points to a close relation, as well as to the transmission of disease by milk. It was noticed that an epidemic sore throat in a certain village followed the route of a particular milkman. On inquiry it was found that at the farm from which this milk came the cows were affected with the foot-and-mouth disease. An elaborate investigation practically established the fact that the milk of cows suffering from this disease would produce a sore throat resembling scarlet fever. Subsequently this same locality was visited by an epidemic of true scarlet fever, and no individual who had previously had this sore throat was attacked.—(Stickler, *N. Y. Med. Rec.*, Sept. 13, 1890).

Such cases as these, of which there is clear proof, are sufficient to show that an unknown danger lurks in every specimen of unsterilized milk, unless very recently drawn from a cow known to be sound and clean into vessels known to be aseptic.

STERLET. See **STURGEON.**

STERLING, an epithet generally applied to the money of the United Kingdom. The original standard of money was weight, and among the Anglo-Saxon and Teutonic nations the basis of weight was in early times supplied by the wheat-corn. Charlemagne superseded the earlier systems by a new coinage, in which a pound of 12 ounces became the money weight, each pound being divided into 20 solidi, and each solidus into 12 denarii of the weight of 32 wheat-corns. The older *sifer* or scruple of 24 wheat-corns being superseded by the penny of 32 wheat-corns, the term *sterling* seems to have been applied to the latter, in consequence of its being in use among the Ripuarian or Austrasian Franks, sometimes called the *Esterlings*, while the old scruple continued to be used by the Northmen. In England where the change was early introduced, the word *sterling* came in the course of time to indicate the fineness or standard of the silver; and nearly the same standard, consisting of 11 oz. 2 dwt. of pure silver, and 18 dwt. of alloy to the pound troy, or $\frac{18}{32}$ dwt., seems to have subsisted from the 12th c. downward. The superiority of the English standard silver to all other currency has been generally acknowledged over Europe; and hence the adjective *sterling* has become a synonym for pure and genuine.

STERLING, a co. in central S. Dakota, formed in 1883. It is drained by the Cheyenne river; 1185 sq. m.; unorganized; pop. '90, 96.

STERLING, a city in Whiteside co., Ill.; on the Rock river, and the Chicago and Northwestern and the Burlington Route railroads; 110 miles w. of Chicago. It has electric lights, waterworks supplied from artesian wells 1600 feet deep, about 15 churches, national banks, daily and weekly newspapers, a railroad and a highway bridge across the river, Sterling and Wallace high schools, Lincoln school, and public library. The principal industries are farming and manufacturing, for which there is good water-power. Pop. '90, 5824.

STERLING, JOHN, 1806-44; b. Scotland; educated at Glasgow and Cambridge. He was for a time connected with the London *Athenæum*. He took orders in the English church, but after a short service as a curate, devoted himself entirely to literature. Among his writings are *Arthur Coningsby* (1833); *Poems* (1839); *The Election*, a poem (1841); and *Strafford*, a drama (1843). He is more celebrated from Carlyle's *Life of John Sterling* (1851), than from his own works. A memoir of him, with 2 vols. of *Essays and Tales* was published by J. C. Hare in 1848.

STERNBERG, a t. of Austria, in Moravia, 12 m. n.n.e. of Olmütz. Pop. '90, 15,395. It was founded in the 13th century by Jaroslav von Sternberg, who defeated the Mongols here in 1241. It has an old church, ruined castle, a weaving school, insane asylum, large tobacco houses, silk works, dye works, and trade in leather. It is the chief seat of the Moravian cotton manufactures, and has also not unimportant manufactures of linen, hosiery, and liquors. The cotton and linen goods made at Sternberg, and in the vicinity, are known as *Sternberg wares*.

STERNE, LAURENCE, though of English descent and parentage, was born at Clonmel, in Ireland, on Nov. 24, 1713. In that country also, in some intermittent way, a good deal of his boyhood was passed with possibly some effect in developing that oddity and whimsical exuberance long after to find vent in his writings. His father was of a good Yorkshire family, and as lieutenant in a marching regiment led a wandering and unsettled life. When about ten years old, the boy was consigned to the care of his kinsman, Mr. Sterne of Elvington, in Yorkshire, by him put to school near Halifax, and thence, on his approving himself a lad of parts, transferred, in 1733, to Jesus college, Cambridge, where, in 1736 and 1740 respectively, he took the degrees of bachelor and master of arts. He was educated for the church, and on his leaving the university, his uncle the Rev. Jacques Sterne, an ecclesiastical dignitary of some magnitude, procured for him the living of Sutton in Yorkshire. With this relative he afterward quarreled, but not before another appointment had been secured him as prebendary of York cathedral. In 1741, he was married to a lady whom he met in York, and soon after, through the influence of a friend of his wife, he was presented to the additional living of Stillington. For nearly 20 years he lived at Sutton unheard of. That his devotion to his clerical duties was great, is more than can be supposed from what we know of his character; and we can readily believe the "books, painting, fiddling, and shooting," which he tells us were his choice recreations, formed pretty much the business of his life. Up to the year 1759, in which the first two volumes of his *Tristram Shandy* appeared, he had published only two sermons, which, according to his own statement, "found neither purchasers nor readers." *Tristram Shandy*, which, though published without his name, was from the first known to be his, had instant and immense success, and Sterne, on going up to London, found himself the literary lion of the day. In 1761, two more volumes of it appeared, followed by vols. 5 and 6 in 1762, vols. 7 and 8 in 1765, and in 1767 by the 9th and last. During this period he also issued 4 vols. of sermons, and the *Sentimental Journey*, published in the beginning of 1768, completes the list of his works. He died on March 18 of that year, his health having been much impaired for some considerable time.

From the time of his becoming famous his parishioners saw of Sterne but little. He lived mostly either on the continent or in London, where his literary celebrity made him welcome in the best circles. Always an easy, mercurial kind of mortal, he now led some-

what a gay and dissipated life, rather modelled on the epicurean maxim of enjoying the present hour, than on those more serious precepts he had been wont to enforce from the pulpit. But except that he does not seem to have been excessively devoted to his own wife—she and her daughter being in these pleasant years but little with him—and was a little of a sentimental Lothario in respect of the wives of other people, no very great harm is known of him. He is said, despite of the exquisite sentiment which abounds in his writings, to have been really heartless, and unfeeling; and the sneer of Walpole that he could snivel over a dead ass, to the neglect of his live mother, is familiar to almost every one. It is in fairness, however, to be said that the implied slander rests on no distinct basis of evidence.

Whatever question may be made of the worth of Sterne as a man, there can be none of his genius as a writer. *Tristram Shandy*, his chief work, must live as long as the language, were it only in virtue of the three characters of Old Shandy, Uncle Toby, and Trim, the most perfect and exquisite, perhaps, in the whole range of British fiction. These are genuine creations, at once fantastic and real, in which the subtlest reconciliation is effected between the sportive exuberance of fancy and the sober outlines of truth. Otherwise there is a good deal in the work which needs excuse; in particular a most willful and gratuitous indecency almost without a parallel, and a constant trick of lawless and whimsical digression, to the endless incalculable frivolities of which even the inimitable grace, ease, and tricky flexibility of the style can with difficulty reconcile the reader. The humor of Sterne is notwithstanding the most subtle, airy, delicate, and tender to be found in our literature; and in many passages he shows himself master of a pathos equally exquisite and refined. The fullest, and in every way, best account of Sterne will be found in his *Life*, in 2 vols., by Mr. Percy Fitzgerald, published in 1864. Though against the charge of unclerical levity, at once in his writings and his life, it is impossible to defend Sterne, except as the laxer *morale* of his time may afford some slight palliation of it, candid investigation suggests a more kindly view of his character than that formerly current. See Traill's *Sterne* (1882).

STERNHOLD, THOMAS, one of the authors of the English version of psalms formerly attached to the book of common prayer, was a native of Hampshire, and born toward the close of the 15th century. He held the office of groom of the robes to Henry VIII. and Edward VI., and died in 1549. At the reformation period, when the practice of singing metrical psalms—first introduced by Clement Marot among the gay courtiers of Francis I.—was taken up by the reformers, Sternhold undertook to render the whole book of psalms into English verse. He only lived to complete twenty-one psalms; and his version was published after his death under the title of *All such Psalm of David as Thomas Sternhold did in his Lyfe drawe into English metre* (Lond. 1549). Sternhold's labors were completed by John Hopkins and William Whittinghame, and first annexed to the book of common prayer with the music attached, as *The Whole Booke of Psalmes, collected into English metre by Thomas Sternhold, John Hopkins, and others; compared with the Ebrue, with Notes to sing withal*. Sternhold's and Hopkin's songs are very literal, but somewhat coarse and homely in phraseology. They were used in the church service of England till superseded by the version of Tate and Brady, which appeared in 1698. They were also in use in Scotland down to the middle of the 17th century.

STERNIDÆ. See **TERN**.

STERNUM, a portion of the skeleton of animals. It is present in the articulates (arthropoda) and crustaceans, as well as arachnides and insects, and in those vertebrates having exoskeletons, as tortoises, although Mivart and many others hold that the plastron does not form (or contain) a sternum—in other words, that the chelonians are sternumless. A true sternum, however, belongs to the warm-blooded vertebrates, and reaches its highest development in the birds. The somites of locusts have well-developed sternal sections included between the pleura or side portions of the segments, especially in the abdomen. All these sternal sections are collectively called the *sternum*. It can, however, be said to be only analogous to the mammal sternum, or the sternum of birds. It has nearer relations to the sternal pieces of the tortoises, because the plastron which these pieces constitute is a part of the exoskeleton, and, as above mentioned, is by many not regarded as a true sternum. In some mammals, and especially in man, there might seem to be more analogy (if analogies are to be strained) between the sternum and the "exoskeleton sternum," than between this latter and the sternum of birds, for in them the relations with the rest of the endoskeleton are much more extensive. Man's sternum is little else than a point of attachment for certain pleural pieces, the ribs and rib cartilages, and a covering or shield for the central part of the thorax. In the chelonians the whole of the under shell, or plastron, is regarded by some as a sternum, and composed of pairs of pieces, and one single piece, the *entosternal*. The pairs are the *episternals*, the most anterior, arched portion of the plastron, and including within the arch the *entosternal*; the *hyosternals* and *hyposternals*, respectively anterior lateral and posterior lateral, and not joined together as pairs in the median line. Posteriorly, and joined together at their extremities, are the *xiphisternals*, small curved pieces, forming an arch, like the anterior episternals. In birds of flight the sternum is the most important bone in the body; it is enormously expanded, and gives attachment to the powerful pectoral muscles which move the wings. In birds of great powers of flight it extends

over the abdominal cavity, and sometimes reaches the pelvis. In all birds which fly it has a median ridge, called the keel, which is prominent in proportion to the powers of flight, examples of which are seen in the sternum of the pigeon, the duck, and the wild goose. In ostriches and other birds which do not fly the sternum has no keel. In the mammalia it is composed of several pieces, usually three, the *manubrium*, or anterior portion, the *mesosternum*, or middle portion, and the *xiphisternum*, or posterior portion (in man, xiphoid cartilage). In most mammals the sternum is long and narrow, but in some, as in cetacea, it is broad. The Greenland whale has only a manubrium, while the dugong has this piece and the xiphisternum, the mesosternum being absent. In some mammals, burrowing and flying animals, as the moles and bats, the sternum has a keel, but it is placed differently than in birds, being more anterior. The middle and posterior parts of the sternum in birds are those which are most developed, the manubrium being greatly subordinate or dwarfed.

STERNUTATORIES, are agents which cause sneezing. The most common are the different kinds of snuffs, but other substances are known which produce a more powerful and prolonged action on the nasal mucous membrane. They have been employed in medicine with various objects; as, for example, to restore suspended respiration in cases of fainting, to dislodge foreign bodies from the nasal passages or even the wind-pipe, to avert or check hysterical attacks, and to terminate prolonged fits of hiccup. They are scarcely ever used at the present day.

STESICHORUS, lived about 570 B. C.; b. Sicily; a Greek lyric poet, a contemporary of Pittacus, Alcæus, and Sappho. It is said that he was educated at Catana and afterwards became the friend of Phalaris, tyrant of Agrigentum, but the accounts of his life are mere matters of tradition and consist largely of fables, as illustrated by the story that he was struck with blindness on account of writing against Helen, but recovered his sight after he had published a recantation. His original name was Tisias, and that of Stesichorus (leader of choruses) was given him from his main employment; he is said to have invented the tragic chorus. He excelled in the arrangement of the strophe, antistrophe, and epode, which were called the "three things of Stesichorus." Of his odes, poems, and hymns but a few fragments remain. These consist of fables, elegies, a pastoral poem, *Daphnis*, mythical poems, hymns, encomia, pæans, epithalamia and erotic poems.

STETHOSCOPE, THE (Gr. *stethos*, the chest, and *skopeo*, I look into), is an instrument invented by Laennec for examining the sounds of the chest. The upper part is the chest end, the lower the ear-piece. The most convenient measurements are—length, 7 in., diameter of the ear-piece, 3 in., circumference of shaft, 1½ in., and diameter of chest end, 1½ in. The main object of the stethoscope being to circumscribe and localize the sounds which it transmits, the chest end should be small, in order to determine the exact seat of the greatest intensity of sound. To ascertain this, the instrument should be moved right and left, up and down, till its end is on the exact spot from which the abnormal sound for which we are searching—or, it may be, the absence of sound—proceeds. In the construction of the stethoscope, the following points should be attended to: 1. It should be composed of a material which allows the least amount of sound to be lost, and which least of all modifies or prevents the sound. A porous wood, such as cedar or deal, answers these conditions best, a dense wood, like ebony, having a tendency to modify the sound; 2. It should be of one piece of wood, and not, for example, part ivory and part cedar; 3. The ear-piece should be large and flat to secure perfect apposition and occlusion, and the chest end should be narrow and smoothly rounded over the edge. The various sounds heard through the stethoscope are described in the articles **RESPIRATORY SOUNDS**, **PNEUMONIA**, etc.

STETTIN, an ancient town of Prussia, capital of the province of Pomerania (*Pommern*), situated on both banks of the Oder, quite close to the Stettiner-Haff, 83 m. n.e. of Berlin, with which it is connected by railroad. The entire population, in 1895, was 140,724. The district on the right bank of the river was formerly the suburbs of Lastadie and Silberweisse, and is connected with the left bank by four bridges, including a handsome railway drawbridge. The site of the town is hilly, and consequently the streets are uneven, but the houses are good and the environs are very pleasant. The principal buildings are the old castle, or *Schloss*, dating from 1577, the exchange, military casino, and the theatre. Stettin is the most important manufacturing place in Pomerania, the staple industries being sugar refining, machine-making, and the manufacture of chemicals, perfumery, soap, candles, chocolate, etc. There is also a large iron foundry, where all the anchors of Prussian ships are forged. Corn and spirits are largely exported. The commerce of the city is extensive and increasing. Next to Dantzic it is the most important commercial harbor in the kingdom, although accessible only to small vessels. Stettiner-Haff is formed by an expansion of the river Oder n. of the town, and is nearly quite shut in from the Baltic, having communication with the sea only by three narrow straits, the most important of which is the Swine. See **SWINE-MÜNDE**. Of the two projected canals between the harbor and the Baltic, to be built at the expense of the city, one was begun in 1894 and is almost completed. Stettin, the

ancient *Sedinum*, later *Stettinum*, is of Slavic origin, became a flourishing commercial town in the middle ages, joined the Hansa, and was frequently the residence of the dukes of Pomerania, until they became extinct in 1637. It belonged to Sweden from 1648 until 1720, and since then to Prussia.

STEBEN, a co. in extreme n.e. Indiana, adjoining Michigan; drained by Pigeon river and several creeks; traversed by the Lake Shore and Michigan Southern railroad, 330 sq. m.; pop. '90, 14,478, chiefly of American birth. The surface is diversified by lakes and forests, and the soil is fertile; wheat, corn, oats, hay, and pork are the staples. Co. seat, Angola.

STEBEN, a co. in s.w. New York, adjoining Pennsylvania; drained by the Chemung, Tioga, and Conhocton rivers; crossed by the Erie, the Delaware, Lackawanna and Western, and the Fall Brook railroads; about 1490 sq. m.; pop. '90, 81,473, chiefly of American birth. The surface is uneven. The soil is fertile. The principal productions are wheat, corn, buckwheat, barley, wool, and tobacco. There are many saw mills and flour mills. Co. seats, Corning and Bath.

STEBENVILLE, city and co. seat of Jefferson co., O.; on the Pennsylvania Co.'s, the Pittsburg, Cincinnati, Chicago, and St. Louis, and the Wheeling and Lake Erie railroads; 43 m. w. of Pittsburg, Pa. A fort named in honor of baron Steuben was erected here about 1786; the town was laid out in 1798; the city was chartered in 1851; and the area was increased in 1871. The city is built on high land overlooking the river, is the centre of a fertile agricultural region, and is in the vicinity of rich bituminous coal mines. There are natural gas and electric light plants, waterworks supplied from the river, excellent drainage, electric street railroads, about 20 churches, several national and private banks, high school, public school and Odd Fellows' public libraries, female seminary, and daily and weekly newspapers. The chief industries are coal mining and manufacturing, the last including blast furnaces, rolling mills, steel works, glass works, white ware pottery works, and machinery, boiler, flour, paper, fire and paving brick, and sewer pipe plants. Pop. '90, 13,394.

STEBEN, **FREDERIC WILLIAM AUGUSTUS**, Baron, a general of the American revolutionary army, was b. at Magdeburg, Prussia, Nov. 15, 1730; educated at the Jesuits' colleges of Niesse and Breslau; and at the age of fourteen served as a volunteer under his father at the siege of Prague. In 1747 he was appointed cadet of infantry, and in 1758 had risen to the rank of adjt.gen. He was wounded in the battle of Kunersdorf, and in 1761 was conducted as a prisoner of war to St. Petersburg, but was shortly after released. The following year he was appointed adjt.gen. on the staff of the Prussian king, effected important reforms in the quartermaster's department, and superintended an academy of young officers selected for special military instruction. At the close of the seven years' war, he traveled in Europe, and was appointed grand marshal and general of the guard of the prince of Hohenzollern-Hechingen. Being on a visit to Paris in 1777, where the cause of the American rebellion was favored by the government, he was invited by count St. Germain to go to America. He arrived at Portsmouth, Virginia, Dec. 1, 1777, and offered his services to Gen. Washington, which were joyfully accepted; and he joined the army, then in the most deplorable condition, at Valley Forge. He was appointed inspector-general, prepared a manual of tactics for the army, remodeled its organization, and improved its discipline. He was one of the officers who composed the court-martial at the trial of Maj. André. In the campaign of 1780 he had a command in Virginia, and was on the staff of Gen. Lafayette at the siege of Yorktown. As generous in character as he was capable as an officer, he spent his whole fortune in clothing his men, and gave his last dollar to his soldiers. Congress made tardy reparation, and in 1790 voted him an annuity of \$2,500, and a township of land in the state of New York, both of which he divided with his fellow-officers. He died on his estate near Utica, N. Y., Nov. 28, 1794. See Sparks's *American Biography*, and a life by Friedrich Kapp (New York, 1860).

STEBEN, a former co. in Dakota, formed in 1873 from part of Buffalo; subsequently divided between Ward and McLean cos., N. Dakota. Pop. '90, 16.

STEBEN, a co. in s.w. Kansas, intersected by the Cimarron river; 728 sq. m.; pop. '90, 1418, chiefly of American birth. The surface is undulating and the soil is fertile. It has Oklahoma for its s. boundary. Co. seat, Hugoton.

STEBEN, a co. in w. Minnesota, intersected by the Great Northern railroad; 576 sq. m.; pop. '90, 5251, chiefly of American birth, with colored. It is drained centrally by the Pomme de Terre river. Its surface is hilly; the soil is fertile, producing grain and potatoes, and furnishing excellent pasturage. Co. seat, Morris.

STEBEN, an extensive co. in n. Washington, having the boundary line of British Columbia for its n. border; 6194 sq. m.; pop. '90, 4341, chiefly of American birth, with colored. It is bounded on the east by the state of Idaho, and on the w. by the Cascade range of mountains. It is drained by the Columbia river, Clark's Fork, and the Okanagon river; also by lake Osoyoos in the n., and lake Chelan in the extreme s.w. Its surface is mountainous in the w., and in the e. is composed of barren plains relieved by tracts of prairie land of great fertility, producing grain and potatoes, and furnishing good pasturage. Gold is among the mineral products. Co. seat, Colville.

STEVENS, ABEL, D.D., b. Philadelphia, 1815; educated at Wesleyan university, Middletown; settled pastor of a Methodist church in Boston, 1834; traveled in Europe, 1837; returning, was stationed at Providence, R. I.; became editor of *Zion's Herald*, Boston, 1840; *National Magazine*, New York, 1853-4; revisited Europe, 1855; edited *Christian Advocate and Journal*, 1856; co-editor of the *Methodist*. He has published *Memorials of the Introduction of Methodism into New England*; *Memorials of the Progress of Methodism in the Eastern States*; *Church Polity*; *The Preaching required by the Times*; *The Great Reform*; *History of the Methodist Episcopal Church in the United States*, 4 vols.

STEVENS, ALEXANDER HODGDON, LL.D., 1789-1869; b. New York; graduated in 1815 at the university of Pennsylvania; became surgeon in the New York hospital; from 1825 to 1837 he was professor of surgery in the College of Physicians and Surgeons of New York; from 1837 to 1839 professor of clinical surgery; and from 1841 to 1855 president of the college. He was made president of the medical society of the state of New York in 1848.

STEVENS, ALFRED GEORGE, 1817-75; b. England; studied art in Italy, 1833-42. On his return to England he devoted himself especially to decorative art, such as wood and marble carving and the painting of ceilings and panels. His greatest work was the modeling of the Wellington monument in St. Paul's, which was not completed at the time of his death.

STEVENS, EBENEZER, 1751-1823; b. Boston. He was active in the agitation which led to the revolution and was one of the celebrated "tea party" of 1773. In 1775 he was commissioned lieut., raised two companies of artillery and one of engineers, and accompanied them to the siege of Quebec. He had command of the artillery at Ticonderoga and Stillwater, and in part at Yorktown. He also served with Lafayette in Virginia. In 1814 he took part in the defense of New York.

STEVENS, EDWARD, 1745-1820; b. Va.; col. of the 10th Virginia regiment in the revolutionary war, through which he served with distinction, attaining the rank of brig. gen. He was afterward long a member of the Virginia senate. He enjoyed the confidence of Washington.

STEVENS, EDWIN AUGUSTUS, 1795-1868; b. N. J.; established, with his brothers, lines of steamboats on the Hudson and several other rivers; and introduced various improvements in machinery and naval architecture. He endeavored, at the beginning of the civil war, to induce the government to make use of the iron-clad vessel begun by Robert L. Stevens, but the offer was declined. He left in his will \$1,000,000 for the completion of the vessel, but that amount was not sufficient, and it was sold to the United States navy in 1874, by the state of New Jersey, to which it had been bequeathed. Congress, however, neglected to make the appropriation, and the vessel was sold in 1880 for a very small amount. Mr. Stevens endowed the Stevens High School at Hoboken, and left nearly \$1,000,000 to found the Stevens Institute of Technology.

STEVENS, HENRY, b. Vt., 1819; graduated at Yale college, 1843, and Cambridge law school, 1844. He resided in London after 1845 for the purpose of purchasing rare and valuable books, and added largely to the collection of American books in the British museum, procuring many valuable works for the Smithsonian institution, the library of congress, and other libraries in the United States. Among his publications are *Catalogue Raisonné of English Bibles*; *Catalogue of American Books in British Museum*; *Bibliotheca Americana*; *Bibliotheca Historica*. He d. 1886.

STEVENS, ISAAC INGALLS, 1818-62; b. Mass.; graduated at West Point, served through the Mexican war, was principal assistant at the U. S. coast survey office, 1849-53, when he resigned from the army to become governor of Washington territory, from which he was delegate to congress, 1857-61. He was a maj. gen. of volunteers in the late civil war, and was killed at Chantilly, while leading a charge.

STEVENS, JOHN, 1749-1838; b. N. Y.; a competitor with Fulton in the building of steamboats, experimenting in their manufacture for nearly 30 years, the sight of John Fitch's steamboat being the incentive to his ambition. In 1804 he built a screw propeller, and afterward the *Phoenix*, with sectional boilers and high-pressure condensing engines, which was completed soon after Fulton's *Clermont*. Fulton had the exclusive right to navigate the Hudson, so Stevens contented himself with the Delaware and Connecticut rivers. He designed, in 1812, a circular iron-clad, similar to those now in the Russian navy, and published a pamphlet setting forth the advantages of railway travel, and suggesting the construction of a railway from Albany to lake Erie. He made the plans for the Camden and Amboy railroad.

STEVENS, JOHN AUSTIN, 1795-1874; b. N. Y.; educated at Yale, and went into business. He was one of the first members of the New York chamber of commerce, of which he was for many years secretary. He was president of the bank of Commerce, 1839-66, the first president of the merchant's exchange, which he helped to establish, and during the war president of the associated banks of New York, Boston, and Philadelphia; and the loans made by them to the U. S. government were made under his direction, as chairman of the treasury note committee. His opinion on financial subjects was much sought for at the treasury department. Though a whig, he was in favor of free trade.

STEVENS, PHINEHAS, b. Sudbury, Mass., 1707; d. 1756, removed with his father to Rutland, New Hampshire. At 16 he was taken prisoner and carried to Canada. He joined in an expedition against Canada, 1746, and gallantly defended his station in Charlestown, on the frontier, from the French and Indians in 1747. In acknowledgment of his bravery he received a valuable sword from Commodore Knowles, and was commandant of the fort until 1750. In the *New Hampshire Hist. Colls.*, v. 199, is an account from his pen of his expedition to Canada in 1749.

STEVENS, P. F., D.D., b. Fla., 1830; graduated at the State military acad., Charleston, S. Car., 1849; was ordained deacon in the Prot. Epis. church, 1861, and presbyter, 1863. Joining the Ref. Epis. church, he was consecrated bp., at Philadelphia, 1879. Bp. S. has jurisdiction over the special missionary district of the South, and is stationed at Charleston, S. Car.

STEVENS, ROBERT LIVINGSTON, 1787-1856; b. N. J.; son of John Stevens; had charge of his father's steamboat, the *Phoenix*, in its passage to the Delaware. In 1808 he introduced concave water lines in the hull of the *Phoenix*, which was the first application of the wave line to shipbuilding. He invented in 1813 percussion elongated shells for smooth-bore guns, and sold his invention to the government. In 1818 he burned anthracite coal in a cupola furnace, using it soon afterward in his steamers. In 1822 he substituted the skeleton wrought-iron working beam for the heavy cast-iron one before in use; and introduced many other improvements in navigation and steam machinery. He was commissioned by the government in 1842 to build an iron-plated war steamer or battery, to be shell-proof and driven by screws, but he died before it was completed.

STEVENS, THADDEUS, 1792-1868; b. Vt.; graduated at Dartmouth college, 1815; taught school in York, Penn., and studied law; began practice in Gettysburg; removed to Lancaster, 1842. In the presidential campaign of 1828 he opposed Jackson, and from that time on was an active member of the whig party. He was first elected to congress in 1848. Previous to this time he had served in the state legislature and as canal commissioner, 1838. He was already an opponent of the slave system, and in the two terms from 1848-52, vigorously attacked the fugitive slave law, the Missouri compromise, and the Kansas-Nebraska bill. From 1852 to 1858 he occupied himself with professional work; in the latter year was again elected to congress, and held his seat until the time of his death. He was chairman of the committee of ways and means for three sessions, and of the "reconstruction" committee of the 39th and 40th congresses. In the impeachment of President Johnson he acted as chairman of the board of managers. The issuing of the emancipation proclamation by President Lincoln and the adopting of the 14th amendment were measures earnestly advocated by Mr. Stevens.

STEVENS, WILLIAM BACON, D.D., LL.D., b. Bath, Me., 1815; educated at Phillips acad., Andover, Mass., and in the medical department of Dartmouth coll.; practised medicine in Ga., and was appointed historian of that state. He relinquished his profession for the study of theology, and was ordained deacon in the Prot. Epis. church, 1843; ordained priest, 1844; rector of Emmanuel church, Athens, Ga., and St. Andrew's church, Philadelphia. He was consecrated asst. bp. of Penn., 1862, and, upon the death of Bp. Potter assumed the full episcopal charge of the diocese. Bp. Stevens, who was for a time prof. of belles-lettres in the univ. of Georgia, had written extensively upon religious and controversial topics, his principal works being *Parables of the New Testament practically Unfolded*, and *Consolation, The Bow in the Cloud*. He also compiled a history of Ga. He d. 1887.

STEVENS INSTITUTE OF TECHNOLOGY, at Hoboken, N. J. A school of mechanical engineering founded by Edwin A. Stevens, who left for it in his will \$650,000, and a block of ground. Annual income about \$81,000. It has fitted large numbers of young men for responsible positions in various industrial pursuits such as machine shops, electric works, motive power of railroads and the like. The course is for four years, and includes instruction in mathematics, physics, general and analytical chemistry, mechanics, mechanical engineering, mechanical drawing, engineering practice, general and applied electricity, experimental mechanics and shop-work, applied mathematics, belles-lettres and modern languages. Extensive workshops are provided, equipped with all varieties of machine tools, steam engines, etc., and in addition there are a large collection of all forms of prime motors, such as steam, gas and air engines, compressors, pumps, and other machinery, with which instruction is given in conducting all sorts of tests as to the power and economy of such machines. This department of experimental mechanics has been and is a leading feature of this institution. In addition to its original endowment, the institute has received at various times contributions from its president, Henry Morton, PH.D., amounting in the aggregate to between \$50,000 and \$60,000, and recently from Mrs. E. A. Stevens, widow of the founder, real estate valued at \$30,000. The institute possesses a good library of works of reference and scientific journals. Number of instructors in 1896, 22; students, 254.

STEVENSON, ADLAI EWING, was born of Scotch-Irish ancestry in Kentucky in 1835, and received his education at Centre College, Danville, Ky. He began the study of law in Bloomington, Ill., in 1858, and after being admitted to the bar, commenced practice in Matamora, but returned to Bloomington in 1869, where he still resides. He was elected to congress in 1874, and re-elected in 1878; appointed First Assistant Postmaster-General 1885-89; Vice-President of the United States in 1892-97.

STEVENSON, JOHN JAMES, geologist, born New York, October 10, 1841, was graduated at New York university in 1863 and 1867, and became professor of chemistry at West Virginia university in 1869. He has been professor of geology in New York university since 1871. As geologist on the Ohio and Pennsylvania surveys, he classified the upper coal measures of those states; and while chief geologist of the U. S. geographical surveys w. of the 100th meridian, described the coal area of New Mexico and southeastern Colorado. He is correspondent of the more important geological societies of the world, and is president of the New York academy of sciences as well as vice-president of the geological society of America. Princeton university conferred LL.D. upon him in 1893. The titles of his published books and papers number more than one hundred.

STEVENSON, ROBERT, a Scotch engineer, was born at Glasgow, June 8, 1772. His father, who was a merchant connected with the West India trade, died during his infancy; and his mother having (1786) married Mr. Thomas Smith, the first engineer of the light-house board, young Stevenson was led to devote himself to the study of engineering, in which his progress was so rapid that in 1791 he was intrusted by Mr. Smith with the erection of a light-house on Little Cumbrae. In 1796 he succeeded his father-in-law as engineer and inspector of light-houses; and during his 47 years' tenure of that office, he planned and constructed no fewer than 23 light-houses round the Scottish coasts; employing the catoptric system of illumination, and his valuable invention of "intermittent" and "flashing" lights. The most remarkable of these erections was that on the Bell Rock (q.v.), for which he had been sketching plans for some time, when the wreck of the *York*, a 74-gun ship, on this reef drew general attention to the same subject. The enterprise was quite unprecedented in light-house engineering, for in the only instance at all analogous—the Eddystone light-house—the rock was barely submerged at flood, while the Bell Rock was never uncovered except at very low ebb tides. In 1814, Stevenson was accompanied in his tour of inspection by sir Walter Scott, and while the former was projecting another light-house on the Skerryvore (q.v.) near Tiree, the latter was doubtless laying up ample materials for those minute descriptions of the w. coast of Scotland and its islands which were afterward embodied in the *Lord of the Isles*. Stevenson was also in great request as a consulting engineer in the matter of roads, bridges, harbors, canals, and railways, introduced many improvements in their construction, and occasionally co-operated with Rennie, Telford, and others. He died in Edinburgh, July 12, 1850. Like most eminent practical men, Stevenson has left few literary remains; these being merely four volumes of professional printed reports, a large work on the Bell Rock light-house, some articles in the *Encyclopedia Britannica*, and in the *Edinburgh Encyclopedia*, and a series of letters. See his *Life* by his son (1878).

STEVENSON, ROBERT LOUIS BALFOUR, Scotch author; b. Edinburgh, 1850; was graduated at Cambridge univ.; studied law, but abandoned law for literature; came to America as an emigrant, 1879, for the purpose of studying emigrant life; married in California, and resided after 1889 in Samoa. Among his works are, *An Inland Voyage* (1878); *Travels with a Donkey* (1879); *Familiar Studies of Men and Books* (1882); *Treasure Island* (1883); *A Child's Garden of Verses* (1885); *The Strange Case of Dr. Jekyll and Mr. Hyde* (1886); *The Silverado Squatters* (1883); *Memoirs and Portraits* (1887); *The Master of Ballantrae* (1890); *Eight Years of Trouble in Samoa* (1892); *David Balfour* (1893); *Island Nights' Entertainments* (1893); *The Ebb Tide* (1894). He died in December, 1894.

STEVENS POINT, city and co. seat of Portage co., Wis.; on the Wisconsin river and the Green Bay and Western and the Wisconsin Central railroads; 63 miles w. of Appleton. It is an important lumbering center, particularly for pine; has good waterpower; and contains the shops of the Wisconsin Central railroad, a large number of saw, planing, and shingle mills, foundries and flour mills. There are gas and electric light plants, national and state banks, and daily and weekly newspapers. Pop. '90, 7896.

STEWARD OF ENGLAND, LORD HIGH, one of the great officers of state, and anciently the first officer of the crown in England. The dignity was in early times hereditary. From Hugh Grentmesnell, lord steward in the time of Henry II., it passed by the marriage of his daughter and co-heir to the family of De Bellomonts, earls of Leicester, and thence also by marriage to the Montforts, earls of Leicester. On the death and attainder of Simon de Montfort, earl of Leicester, in 1265, the office, reverting to the crown, was granted with the earldom of Leicester to Edmund, younger son of Henry III., and continued annexed to the earldoms of Lancaster and Leicester, till absorbed into the royal dignity on the accession of Henry IV. Since that time, there has been no permanent lord steward, but the office is temporarily revived when occasion requires, a lord steward being appointed under the great seal *pro hac vice* at a coronation, or the trial of a peer (see PARLIAMENT). When the proceedings are at an end, the lord steward terminates his commission by breaking his wand of office.

STEWARD OF THE HOUSEHOLD, LORD, an officer of the royal household in England, of great antiquity, originally designated the lord great master of the household. He is the head of the ancient court called the *board of green cloth*, and as such has the control of all the officers and servants of the household, except those belonging to the chapel, the chamber, and the stable. The other members of the board of green cloth are the treasurer and the controller, over whom, as well as the master of the household, the lord steward's authority extends. That court had, by 3 Hen. VII. c. 14, and 33 Hen. VIII. c. 12, authority to try and punish all treasons, misprisions, murders, manslaughter

ters, bloodsheds, etc., in the royal palace, and within the verge of the court. But this jurisdiction, which had long fallen into disuse, was in part repealed by 9 Geo. IV. c. 31, and altogether abolished by 12 and 13 Vict. c. 101; and the functions of the board of green cloth are now confined to the supervision of the household expenses and accounts, the purveyance of the provisions and their payment, and the good government of the servants of the household. The lord steward selects all the subordinate officers and servants, except those connected with the royal stables; he also appoints the queen's tradesmen. He is always sworn a member of the privy council, and has precedence of all peers of his own degree. He has no formal grant of office, but receives his charge from the sovereign in person, who, delivering to him a white wand as his staff of office, says: "*Seneschal, tenez le bâton de notre maison.*" He holds his appointment during pleasure, and his tenure depends upon the political party to which he belongs. The salary of the office is £2,000.

STEWART, a co. in w. Georgia, having the Chattahoochee river for its w. boundary, separating it from Alabama; 450 sq.m.; pop. '90, 15,682. It is drained by the Han-nabatchee and Pataula creeks. Co. seat, Lumpkin.

STEWART, a co. in n.w. Tennessee, adjoining Kentucky; drained by the Cumberland and Tennessee rivers, the latter of which bounds it on the w.; crossed by the Louisville and Nashville railroad, about 500 sq.m.; pop. '90, 12,193, inclu. colored. The surface is rolling. The soil is fertile. The principal productions are corn, cotton, and tobacco. Co. seat, Dover.

STEWART, THE FAMILY OF. The origin of the Stewarts, long obscured by myth, was rediscovered in the beginning of the present century by the indefatigable antiquary, George Chalmers. Alan, son of Flahald, a Norman, accompanied the conqueror into England, and obtained by his gift the lands and castle of Oswestry in Shropshire. His eldest son, William, remaining in England, became the ancestor of the Fitzalans, earls of Arundel, from whom the duke of Norfolk inherits that earldom through an heiress. The second son, Walter, passing into Scotland in the service of David I., had large territorial possessions conferred on him by that monarch, along with the dignity of steward of Scotland, which became hereditary in his family, and was assumed by his descendants as a surname; some branches of the house, when spelling began to be considered, modifying the orthography to Steuart, or the French form Stuart. The fess chequy adopted as the arms of the family is emblematical of the chequer of the steward's board. The connection between the Stewarts and Fitzalans was shown by Mr. Chalmers to have been well known and acknowledged as late as 1336, when Richard Fitzalan, earl of Arundel, sold the stewardship of Scotland to his sovereign, Edward III. and Edward Balliol, as king of Scotland, ratified the transaction; the sale being a political fiction, founded on a supposed forfeiture of the Scottish branch of the family, by which the hereditary office reverted to the English branch.

The lands conferred on Walter the steward by David I. included the barony, or what is now the county of Renfrew, which became the chief patrimony of the family, as well as Innerwick, Hassendean, and other large estates in Teviotdale and Lauderdale. For seven generations the stewardship continued to descend without a break from father to son. Walter, the third, and grandson of the first steward, held, in addition, the office of justiciary of Scotland, and was one of the two ambassadors sent to conduct Marie de Couci, second wife of king Alexander II., to her adopted country. His third son, Walter, called Balloch, by his marriage with the younger daughter of Maurice, earl of Menteith—the lady's elder sister having been banished and her rights forfeited—got the earldom of Menteith, and was ancestor of a line of earls and countesses of Menteith, of whom the countess Margaret carried the earldom to her husband, Robert, duke of Albany, son of king Robert II. Alexander, fourth steward, was regent of Scotland in Alexander III.'s minority; he commanded at the battle of Largs in 1263, when the Scotch army obtained a signal victory over Haco of Norway; and invading the isle of Man, annexed it to the Scottish crown. From his second son, sir John Stewart, who married the heiress of Bonkyl, sprang various important branches of the family, including the Stewarts of Darnley, Lennox, and Aubigné. James, the fifth steward, was one of the six regents of Scotland after the death of Alexander III. Walter, the sixth steward, occupies a conspicuous place among Bruce's companions-in-arms. When but a youth, he did considerable service as one of the principal leaders at Bannockburn, and, four years later, increased the promise of his fame by his successful defense of Berwick against Edward II. in person. His marriage with Marjory, daughter of Robert Bruce, eventually brought the crown of Scotland to his family. He died at the age of 33, much lamented throughout Scotland. His son by Marjory Bruce, Robert, seventh high steward, was regent from 1338–41, and afterward during the captivity of his uncle, David II., from 1346–57; and in the midst of events which threatened a total overthrow to the liberties of Scotland, he exerted himself with zeal and energy in their defense, and was the main instrument in defeating the intrigues of David II. and Edward III. to place an English prince on the throne. On the death of David II. in 1371 he ascended the throne as Robert II., and died in 1390. He was twice married; first to Elizabeth, daughter of sir

William Mure of Rowallan, and afterward to Euphemia, countess of Moray, daughter of Hugh, earl of Ross, and had issue by both unions. In consequence of Elizabeth Mure being related to him within the prohibited degrees, he obtained a dispensation for the marriage from pope Clement VI. in 1347, in which those children who had already been born, as well as those to be born of that connection, were legitimated; and the succession to the crown was further regulated by parliament. In later times, when the true history of these proceedings was lost or mystified, the descendants of Robert II.'s first marriage came to be branded with the suspicion of illegitimacy, while those of the second marriage were in the habit of boasting of their preferable claim to the throne; and the dispensation setting the question at rest was only discovered in the Vatican in 1789 by Andrew Stuart of Castlemilk. Of the children by the first marriage, the third son, Robert, duke of Albany, and his issue are separately noticed below. The fourth son, sir Alexander Stewart, who got the earldom of Buchan on the forfeiture of the Comyns, ruled over the northern part of Scotland with little less than regal authority, and his savage and ferocious character obtained for him the appellation of the "Wolf of Badenoch." He had no lawful issue, but several natural sons, one of whom stormed the castle of Kildrummy, the residence of the countess of Mar, forcibly wedded that lady, and possessed himself of the earldom; and others were progenitors of the branches of the family known as the Athole Stewarts, of whom the principal were the Stewarts of Garth. For the subsequent history of the royal family, see articles ROBERT II. and III.; JAMES I., II., III., IV., V.; MARY, QUEEN OF SCOTS; JAMES I. (of England); CHARLES I. and II.; JAMES II.; WILLIAM III.; and ANNE.

James II. (of England) was twice married, first to lady Anne Hyde, daughter of lord-chancellor Hyde; and secondly, to Mary Beatrice, daughter of the duke of Modena. By the first marriage he had Mary, queen of William III., and Anne, who succeeded to the throne, neither of whom left issue; and by the second, James, prince of Wales, born in 1688, known as the chevalier St. George, or the elder pretender. Prince James, who was born but a few months before his father's abdication, was commonly but groundlessly alleged to be a supposititious child, and was involved in his father's exclusion from the crown. In 1715 the party who supported him, known in history as the Jacobites, endeavored to procure him the throne by force of arms. In Scotland, the earl of Mar, with about 5,000 men, engaged the royal forces under the duke of Argyll at Sheriffmuir: it was a drawn battle, but the result was a delay as fatal as a defeat. In England, the rising was headed by the earl of Derwentwater, and ended by the unconditional surrender of the insurgents at Preston, when lords Derwentwater and Kenmore were beheaded, and other persons of note executed and attained. James escaped to France; and for the rest of his life resided in obscurity principally at Rome, where he died in 1766. In 1719 he married one of the wealthiest heiresses in Europe, Maria Clementina Sobieski, granddaughter of John Sobieski, king of Poland, and by her had two sons, Charles Edward Lewis Casimir, born 1720, known as the young pretender (see STUART, CHARLES EDWARD), and Henry Benedict Maria Clement, cardinal York, born 1725. Henry Benedict, second son of the chevalier St. George, went to France in 1745 to head an army assembled at Dunkirk for the invasion of England, but the news of the defeat of Culloden put an end to his plan. He then returned to Rome, took orders, and was advanced to the purple by Benedict XIV. in 1747. During his brother's life, he was known as cardinal York; but after his death he assumed the regal style as Henry IX., king of England. His various bishoprics and rich church livings enabled him for long to live in great splendor; but the expulsion of Pius VI. from Rome, and other events of the revolution, drove him to Venice, aged and infirm, stripped of his means, and reduced to absolute poverty. His deplorable situation becoming known to the British court, George III. settled on him an annuity of £4,000, which the cardinal accepted with gratitude, and enjoyed during the remainder of his life. He died in 1807 at the age of 82, the last surviving descendant of James II.

Next to the exiled Stewarts in representation of the royal house as heir-of-line came the descendants of Henrietta Maria, daughter of Charles I., who was married to Philippe, duke of Orleans, brother of Louis XIV. of France. This princess had two daughters, of whom the elder, Mary, was queen to Charles II. of Spain, but died childless; the younger, Anna Maria, married Victor-Amadeus, duke of Savoy and king of Sardinia, and was mother to Charles-Emmanuel III., king of Sardinia, and grandmother to Victor-Amadeus III., king of Sardinia. Victor-Amadeus had three sons who successively occupied the Sardinian throne as Charles-Emmanuel IV., Victor-Emmanuel I., and Charles-Felix, and a daughter who married Charles X. of France, and was mother of Henri, duc de Bordeaux, present representative of the French Bourbons. Victor-Emmanuel and Charles-Felix left daughters only; and the present senior co-representative as heir-of-line of the house of Stewart, as well as that of Tudor, is Maria Teresa, wife of prince Louis of Bavaria and only child of the younger brother of the last duke of Modena, grandson of Victor-Emmanuel IV. The house of Savoy-Carignan, from which the king of Italy springs, does not participate in the Stewart descent.

The branch of the family which the parliamentary settlement called to the throne on the death of Anne were the descendants of the electress Sophia of Hanover, granddaughter of James VI. by her mother the princess Elizabeth Stewart, electress palatine and queen of Bohemia. By this destination, not only were the already mentioned

descendants of Charles I.'s daughter, the duchess of Orleans, excluded, but also the sons of the king of Bohemia and their descendants. The eldest son, Charles Lewis, duke of Bavaria, is represented through his daughter, the duchess of Orleans, by the comte de Paris, grandson of Louis Philippe, late king of the French. Her majesty queen Victoria is sixth in descent from and representative of the electress Sophia, the line of descent being through George I.; George II.; Frederick, prince of Wales; George III.; and Edward, duke of Kent.

We have now briefly to notice the most important cadets of the house of Stewart.

DUKES OF ALBANY, EARLS OF MARCH, LORDS OF ANNANDALE AND MAN.—The dukedom of Albany, forfeited on the attainer of duke Murdoch, nephew of Robert III. (see *infra*), was conferred on Alexander, second son of king James II. of Scotland, who also obtained the earldom of March, and lordship of Annandale and Man. Albany, falling under suspicion of James III., was arrested, and escaping from custody in Edinburgh castle to France, was attainted. He afterward took part in a plot with the discontented barons and Edward IV. of England to place himself on the throne, and joining the English army, captured Berwick. After making his peace with James, and being restored to his dukedom, he again rebelled, and invading Scotland with the earl of Douglas, was routed at Lochmaben, and once more attainted. He was first married to lady Catherine Sinclair, daughter of the earl of Orkney and Caithness, from whom he obtained a divorce on the ground of propinquity of blood, by which his son Alexander was bastardized. By his second wife, the daughter of Bertrand, count de la Tour d'Auvergne, he had a son John, who was restored to the dukedom, assumed the regency of Scotland in James V.'s minority, and was declared heir to the throne. By the settlement of the crown under Robert II., John, duke of Albany, would, had he survived James V., have had a preferable claim to Mary. After a regency of eight years, during which he gave offense by his hauteur and French predilections, he returned to France, became governor of Bourbonnais, attended Francis I. in his unfortunate expedition into Italy in 1525, and died in 1536. By his wife, Anne de la Tour d'Auvergne, he left no issue.

DUKES OF ALBANY, EARLS OF FIFE AND MENTEITH.—Robert, second surviving son of Robert II. and Elizabeth Mure, obtained the earldom of Menteith by marriage with its heiress, and the earldom of Fife by indenture with his sister-in-law, the countess, and was appointed great chamberlain of Scotland in 1383. He practically exercised the regency during his father's declining years, and continued to wield the supreme authority after the succession of his timid and irresolute brother, Robert III., who bestowed on him the title of duke of Albany—i.e., of all Scotland north of Forth and Clyde. His unscrupulous ambition led him to get rid of his nephew, the duke of Rothesay, by starving him, in order to pave his way to the throne; and prince James was sent abroad by his father, lest he should meet a similar fate. On Robert III.'s death, Albany at once became regent of Scotland, and wielded the chief power of the state during the minority and captivity of James I. By his first marriage to Margaret, countess of Menteith, he had a son, Murdoch, who, on his father's decease in 1419, succeeded, unchallenged, to the regency. By his second wife, Muriella, daughter of sir William Keith, the marischal, he had, besides two younger sons of whom there was no succession, a son, John, created earl of Buchan, on whom Charles VII. bestowed the office of constable of France after the battle of Baugé, and who fell at Verneuil, leaving only a daughter, who married the second lord Seton, and is represented by the earl of Eglinton. Duke Murdoch married the eldest co-heiress of the earl of Lennox, and had four sons. On James I.'s restoration, his vengeance fell on duke Murdoch, his sons Walter and Alexander, and his father-in-law Lennox, who were all put to death, and the dukedom of Albany forfeited to the crown. Murdoch's youngest son, James, generally known as "James the Gross," escaped to Ireland, where he had a numerous issue by a lady of the family of the lords of the Isles, some of whom were brought to Scotland, and raised to high honors by James II., and received letters of legitimization, which in the 15th c. conferred far more nearly than at a later date the full rights of legitimacy. The eldest, who was created Lord Avandale, enjoyed for life the estates of the earldom of Lennox, which had belonged to his grandmother, to the exclusion of the descendants of that lady's sisters; and we afterward find the earl of Arran, a descendant of the sixth son of James the Gross, entering a protest in the parliament of 1585 regarding the perfect legitimacy of the house of Ochiltree. From the youngest son, James (not legitimated), sprung the Stuarts of Ardvorlich, Glenbuckie, and others in Balquidder.

LORDS AVANDALE, OCHILTREE, AND CASTLESTUART; EARLS OF CASTLESTUART.—Andrew Stewart, eldest legitimated son of James the Gross, and grandson of Murdoch duke of Albany, was created lord Avandale in 1455, and held the office of chancellor to James III. On his death without issue in 1488, he was succeeded by his nephew, Andrew, eldest son of his also legitimated brother, Walter, who had three sons. The eldest of these, Andrew, third lord Avandale, exchanged his title for that of Ochiltree, and was father of Andrew, second lord Ochiltree, sometimes called the "good lord Ochiltree," an active promoter of the reformed faith, one of the lords of the congregation, and an accomplice in the assassination of Riccio. One of his daughters became the second wife of John Knox; and his younger son, James, has an unenviable notoriety in history. He was the unprincipled and arrogant favorite of James VI.'s early

years; held, along with other offices, that of chancellor of Scotland; was created earl of Arran on the forfeiture of the Hamilton family; and enriched himself with the spoils of the estates of Angus, Mar, Glamis, and other forfeited lords. But his downfall was as sudden as his elevation. At the raid of Stirling, in 1585, he was stripped of his honors, offices, and spoils, the earldom of Arran being restored to the Hamiltons; and in 1596 he was assassinated by sir James Douglas. The second lord Ochiltree was succeeded by his grandson, Andrew, third lord Ochiltree, who resigned the lordship of Ochiltree to his cousin, sir James Stewart of Killeith, son of the earl of Arran, settled in Ireland, where extensive lands were bestowed on him by James VI., and was in 1619 created lord Stuart of Castlestuart in the peerage of Ireland. After the death of the fifth lord Castlestuart in 1684, the title remained dormant till claimed by Andrew, ninth lord, as heir-male of the body of the first lord, which claim was proved to the satisfaction of the Irish house of lords in 1774. The younger branch of the house, to whom the title of Ochiltree was transferred, had come to an end in 1673, and lord Castlestuart claimed also the Ochiltree title; but the evidence adduced by him was held insufficient by the British house of lords. He was, in 1793, created viscount Castlestuart, and, in 1800, earl of Castlestuart; and the present and fifth earl is his great-grandson.

LORDS METHVEN.—Henry Stewart, second son of Andrew, second lord Avandale, became, in 1526, third husband of the princess Margaret of England, widow of James IV., and divorced wife of Archibald, earl of Angus. In 1528 he was created lord Methven. He left no children by the queen-dowager, but by a second marriage had a son, who became second lord Methven, and in the person of whose son, the third lord, the succession terminated.

LORDS DOUNE, EARLS OF MORAY, LORDS ST. COLME.—Sir James Stewart of Beath, third son of Andrew, second lord Avandale, obtained from James V. the hereditary command of the castle of Doune, with the stewardry of Menteith. He had two sons, from the younger of whom sprang the Stewarts of Burray in Orkney. The elder son, James, on the dissolution of the monasteries, obtained the lands of St. Colme, and was created lord Doune in 1581. His son, the second lord Doune, married Elizabeth, the only child of James Stuart, earl of Moray, regent of Scotland, natural son of James V. by Margaret, daughter of John, lord Erskine (see MURRAY, JAMES, EARL OF) and, thereupon became earl of Moray. This nobleman is known in history as the "bonny earl of Moray," and fell a victim to his hereditary enemy, the earl of Huntly, in 1592. His son, the third earl, is believed to have got a new investiture to heirs-male, and from him descends the present and fourteenth earl of Moray. The ninth earl became, in 1796, a peer of Great Britain, as baron Stuart of Castlestuart. Henry Stuart, younger brother of the "bonny earl of Moray," was made a lord of parliament as lord St. Colme in 1611, a title which, however, became extinct on his son's death without issue, and the estates reverted to the earl of Moray. The family of Stuart of Dunearn sprang from a younger brother of the fifth earl.

EARLS AND MARQUISES OF BUTE, LORDS WHARNCLIFFE, LORDS STUART DE ROTHESAY.—Sir John Stuart, a natural son of Robert II., was made hereditary sheriff of Bute and Arran; and his descendant and representative, sir James Stuart, had a baronetcy conferred on him in 1627. Sir James Stuart, grandson of the above sir James, a privy councillor to queen Anne, and a strenuous opponent of the union, was raised to the peerage as earl of Bute. The fourth earl was advanced to the marquise of Bute. The present peer is the third marquis. Two grandsons of the third earl were raised to the peerage as lord Wharncliffe, and a grandson of the same earl, lord Stuart de Rothsay (the latter title is now extinct); and a grandson of the first marquis as lord Stuart de Decies.

EARLS OF ANGUS.—Sir John Stewart (commonly called of Bonkyl), brother of James, fifth steward of Scotland, was progenitor of some of the most considerable branches of the family, and direct ancestor in the male line of James VI. and the Stuart kings who followed him. He married Margaret, daughter and heiress of sir John Bonkyl of Bonkyl, in virtue of which alliance most of his descendants added the bend or buckle of the Bonkyl coat to the fess of the Stuart escutcheon. The issue of this marriage was five sons—1. Sir Alexander Stewart of Bonkyl; 2. Sir Alan Stewart, of Dreghorn; 3. Sir Walter Stewart of Dalswinton; 4. Sir John Stewart of Jedworth; 5. Sir James Stewart of Pierston; and a daughter, Isabel, who married the celebrated Thomas Randolph, earl of Moray, nephew of Robert Bruce. The eldest son, sir Alexander, succeeded to Bonkyl on his maternal grandfather's death, and was father of sir John Stewart, created earl of Angus in 1329. The third earl, grandson of this sir John, was the last male descendant of sir Alexander of Bonkyl; and on his death the earldom devolved on his sister, Margaret Stewart, countess of Angus in her own right. This lady was married to Thomas, earl of Mar, by whom she had no issue; but she had a natural son, George, by William, first earl of Douglas (a connection then deemed incestuous, the earl being brother-in-law to her husband), upon whom, on her resignation, the earldom of Angus was conferred by Robert II. in 1389, and who was ancestor of the Douglasses, earls of Angus.

EARLS OF DARNLEY, EARLS AND DUKES OF LENNOX, LORDS OF AUBIGNÉ.—Sir Alan Stewart of Dreghorn, second son of sir John of Bonkyl, who with his brothers, John and James, fell at Halidon hill in 1333, was ancestor of this distinguished line.

His domains included the extensive lands of Cruickston and Darnley, in Renfrewshire, to which his grandson, sir Alexander Stewart, added Galston by his marriage with Janet, daughter and heiress of sir William Keith of Galston, and widow of sir David Hamilton of Cadyow. Sir John Stewart of Darnley, eldest son of this marriage, distinguished himself much in the French wars, when succors were sent from Scotland to the aid of the dauphin, afterward Charles VII. He was constable of the Scots army in France, and contributed greatly to the victory of Baugé, in recompense for which the lands and lordship of Aubigné and Concessault, in France, were conferred on him, as well as the county of Evreux, with permission for himself and his descendants to quarter the royal arms of France. In 1428, he was one of the ambassadors sent by Charles to negotiate a marriage between the dauphin and the princess Margaret of Scotland; and in the following year, along with a younger brother, William, fell at the siege of Orleans. His marriage with Elizabeth, one of the daughters and co-heirs of Duncan, earl of Lennox, afterward added the Lennox estate to the family possessions. According to arrangements made by permission of the king of France, the lordship of Aubigné was generally enjoyed by a younger member of the family; it went in succession to the third son of sir John Stuart, and to his son, Bernard Stuart. The latter, alike distinguished for military and statesmanlike qualities, had a share in the victory of Bosworth, and supported by arms Charles VIII.'s claim to the throne of Naples. He held, among other dignities, those of viceroy of Naples, constable of Sicily and Jerusalem, and duke of Terra Nova. His grandson, sir John Stuart, was advanced to the dignity of a lord of parliament under the title of lord Darnley; he was also served heir to half the Lennox domains, and claimed the earldom of Lennox. His elder son, Matthew, second earl of Lennox, fell at Flodden; his younger son, Robert, got the lordship of Aubigné in 1508, on the death, without issue, of Bernard Stuart, whose daughter was his first wife, John, the third earl of Lennox, was son of the second earl by Elizabeth, daughter of James, lord Hamilton, and niece of James III.; he was one of the lords of the regency in James V.'s minority, and in endeavoring to rescue the youthful king from the thralldom of the Douglasses, he was taken prisoner at Linlithgow, and murdered by sir James Hamilton of Finnart, Arran's natural son. This earl was married to lady Anne Stewart, daughter of John, earl of Athole, and had three sons, Matthew—who succeeded him as fourth earl—Robert, and John. The termination of the male line of Robert III. by the death of James V., along with the imperfect legitimacy of the descendants of the house of Albany, placed Matthew, earl of Lennox, in the position of heir-male of the stewards of Scotland. He married lady Margaret Douglas, only child of Archibald, earl of Angus, by the queen-dowager Margaret, sister of Henry VIII., an alliance which brought his children into the position of being nearest heirs after Mary, queen of Scots, to the crown of England. The issue were two sons, the elder of them the unhappy husband of the unhappy queen Mary, and father of James VI. Lennox, after spending his youth in France and in the wars in Italy, returned home in 1543, and took an active part in the negotiations for the proposed marriage of queen Mary with Edward VI. His subsequent intrigues with England led to his banishment and attainder, but he was recalled and restored to his honors by Mary. After that queen's forced resignation, he was appointed to the regency, and when on his way to hold a parliament at Stirling in 1571, he was attacked by a party of the queen's friends and mortally wounded.

The earldom and estates of Lennox, which, on the death of the fourth earl, had devolved on James VI. by right of blood, were conveyed by him to his uncle, Charles, fifth earl of Lennox, brother of lord Darnley. The marriage of this earl in 1574, with a sister of the first earl of Devonshire, gave great displeasure to Elizabeth, whose own doubtful legitimacy made her very sensitive to possible pretensions to the throne. The sole issue of that union was a daughter, Arabella, and the earldom went in succession to the fifth earl's uncle, Robert, bishop of Caithness, and his cousin, Esme, son of John Stewart, lord of Aubigné, youngest son of the third earl of Lennox, who was created duke of Lennox. The near relationship to the crown, both of England and Scotland, in which the fifth earl's daughter, the unfortunate lady Arabella Stewart, stood, made her an object of jealousy equally to James and Elizabeth. Elizabeth first interfered to prevent her contemplated marriage with her cousin, Esme, duke of Lennox, and afterward imprisoned her for listening to overtures from a son of the earl of Northumberland. The result was, that this lady formed an illicit connection with William Seymour, afterward marquis of Hertford; on the discovery of which, both were summoned by James before the privy council, and severely reprimanded. The consequence was the reverse of what was intended. Lady Arabella privately married Seymour; which becoming known, she and her husband were committed into custody. Both effected their escape: lady Arabella was overtaken in Calais roads, and imprisoned in the tower, where these undeserved oppressions drove her to a condition of lunacy, in which she died, Sept. 27, 1615. Esme, first duke of Lennox, had two sons, Ludovio and Esme, successively second and third dukes of Lennox. The former held the offices of great chamberlain and high admiral of Scotland, and was created earl of Richmond, earl of Newcastle, and duke of Richmond in the peerage of England. The latter, who was also lord of Aubigné, was created earl of March in England, and was father of James, fourth duke of Lennox, who fell under the guardianship of James VI. as his nearest heir-male, and had the title of duke of Richmond, which had expired at his uncle's

death, revived in his favor in 1641. On the death of the sixth and last duke without issue in 1672, king Charles II., as nearest heir-male, was served heir to him in special.

LORD PITTENWEEM.—Alexander Stewart of Galston, younger brother of the first lord Darnley, got from his brother the lands of Dregghorn and Galston. His great-grandson, Thomas Stewart of Galston, had two sons, Thomas and William. The younger son, William, became commendator of the priory of Pittenweem, and his son was made a lord of parliament as lord Pittenweem. The line of the elder son, Thomas, failed in 1650 in the person of Ludovic Stuart of Galston.

STUARTS OF CASTLEMILK.—The earliest proved ancestor of this important and well-allied branch of the Stewarts, was sir William Stewart of Castlemilk, who in 1398 was appointed umpire for the preservation of the western marches, probably descended from the Stewarts of Darnley. Archibald Stuart of Castlemilk was created a baronet of Nova Scotia by Charles II. His line failed on the death of sir John Stuart, fifth baronet, in 1797, when the succession devolved on Andrew Stuart of Torrance and Castlemilk, M.P., the author of *The Genealogical History of the Stewarts*, descended from an uncle of the first baronet, who died without issue.

STEUARTS OF ALLANTON, COLTNESS, etc.—This family, which first came into notice in the 16th c., and includes various men of eminence who would do honor to any line of ancestry, is of unascertained descent, but some traditional accounts make it a branch of Castlemilk. Sir James Steuart of Coltness and Kirkfield, younger brother of sir Walter of Allanton, and his son, sir Thomas, were active Covenanters; and the latter, an energetic member of king William's first parliament, and the framer of the act of 1690 for the regulation of the church of Scotland, was in 1698 made a baronet. His son, sir David Steuart of Coltness, accompanied Archibald, earl of Argyll, in his descent on Scotland, for which he was sentenced to death, but escaped, and was afterward pardoned. His brother, sir Robert Steuart, fourth baronet, was among the more distinguished scientific men of the beginning of the 18th c., and filled the natural philosophy chair in the university of Edinburgh, in which he was succeeded by his son. Sir James Steuart of Goodtrees, lord advocate under king William and queen Anne, author of the *Answers to Dirleton's Doubts*, and one of the most eminent jurists of his time, was younger brother to the first baronet of Coltness. His son, sir James Steuart of Goodtrees and Coltness, also a distinguished lawyer, and created a baronet in 1705, was father of another sir James, who was prince Charles's confidential agent at the court of France, and at the same time the author of various works of merit on political economy and kindred subjects.

EARLS OF GALLOWAY.—Sir Walter Stewart of Dalswinton, third son of sir John of Bonkyl, obtained the lands of Dalswinton from king Robert Bruce, and Garlies from his nephew, John Randolph, earl of Moray. His grandson, sir Walter of Dalswinton, left an only daughter, Marion, who married sir John Stewart, son of sir William Stewart of Jedworth, and probably a descendant of John, fourth son of sir John of Bonkyl. Sir Alexander Stewart of Garlies, eighth in descent from sir John and Marion Stewart, was created lord Garlies in 1607, and earl of Galloway in 1623. In 1796, John, seventh earl of Galloway, was created a British peer as baron Stewart of Garlies. Alan Plantagenet Stewart, tenth earl of Galloway, is present representative.

LORD BLANTYRE.—This branch of the house of Stewart is descended from sir Thomas Stewart of Minto, third son of sir William of Dalswinton and Garlies, the eldest son of the heiress, Marion Stewart. Sir John Stewart of Minto, great-grandson of that sir Thomas, had two sons. The line of the elder, sir Matthew, became extinct in the person of sir John Stuart, who died in the Darien expedition of 1697. The second son, Walter, was educated along with James VI. under George Buchanan, and had the priory of Blantyre bestowed on him by that monarch: he was privy councillor, keeper of the privy seal, one of the four commissioners of the treasury and exchequer, called octavians, and afterward high treasurer. In 1606 he was raised to the peerage as lord Blantyre. The present representative of this branch is Charles Stuart, twelfth lord Blantyre.

VISCOUNTS MOUNTJOY, EARL OF BLESSINGTON.—Sir William Stewart, descended from Walter Stewart of Tonderghie, fourth son of sir William of Dalswinton and Garlies, who was in great favor with James VI., and undertaker for the plantation of escheated lands in Ulster, was made a baronet of Ireland in 1623. His grandson, sir William Stewart, second baronet, was in 1682 created baron Stewart of Ramalton, and viscount Mountjoy in the peerage of Ireland. He served in Hungary at the siege of Buda, and in 1688 undertook a mission from lord-deputy Tyrconnel to James II., then at Paris, when he was thrown into the Bastille, and was a prisoner there for four years. He afterward joined king William at Flanders, and was killed at the battle of Steinkirk. The second viscount, his son, married the daughter and eventually heiress of viscount Blessington. Their son, the third viscount Mountjoy, was advanced to the earldom of Blessington, which title, as well as that of Mountjoy, became extinct on his decease in 1769, though the baronetcy exists.

EARLS OF ATHOLE, LORDS OF LORN AND INNERMEATH.—Sir James Stewart, fifth son of sir John of Bonkyl, killed with his brothers Alexander and John at Halidon hill, had a grant from Robert Bruce of the lands of Pierston and others in Ayrshire, and was father of sir Robert Stewart of Shanbothy and Innermeath. This sir Robert had two sons, John and Robert, who married the two co-heiresses of the princely house of De

Ergadia, lord of Lorn, who were also co-heirs of the line of Robert Bruce. The younger son, Robert of Durrisdere, was ancestor of a line of Stewarts of Rossyth and Craigiehall, to whom Oliver Cromwell's mother is said, on no very certain grounds, to have belonged, and which probably came to an end about 1830. The elder son, sir John, whose wife was the elder and principal co-heiress, had five sons. The eldest, Robert, became lord of Lorn; the third, sir James, known as the black knight of Lorn, was husband of James I.'s widow; and his eldest son, brother uterine of James II., was created earl of Athole, with remainder to the heirs-male of his body. His great-grandson, John Stewart, fourth earl of Athole, was much involved in the political events of Mary's and James VI.'s time. An adherent of the old faith, and at first a staunch supporter of the queen, he nevertheless assisted in her seizure, and took a lead in the association formed in 1567 for the defense of James VI. He headed the confederacy which took up arms against the regent Morton, and induced James to call a parliament. In 1577 he became chancellor of Scotland, and died suddenly under suspicion of poison from Morton. His son, the fifth earl of Athole, had no male issue, but daughters, of whom the eldest was married to the earl of Tullibardine; and at his death, the earldom fell to the crown, and was conferred on the elder branch of the house of Innermeath, to which we now revert.

Robert, lord of Lorn, eldest brother of the black knight, had two sons. The elder of these, John, second lord of Lorn, had three daughters, co-heiresses, who respectively married the earl of Argyll, Campbell of Glenorchy, and Campbell of Ottar, the lordship of Lorn passing to the Argyll family; he had also a natural son, ancestor of the Stewarts of Appin. The second son of Robert, lord of Lorn, was Walter, lord Innermeath, whose descendant and representative, John, sixth lord Innermeath, obtained the earldom of Athole on the death of the above-mentioned fifth earl; with a remainder to the heirs-male of his body, which came to an end on the death, in 1625, of his only son, who had succeeded him in the earldom. The earldom of Athole was then conferred by Charles I. on the earl of Tullibardine, grandson through his mother of the fifth earl of Athole, from whom the existing ducal house of Athole is descended. From Alexander, fourth son of sir John Stuart of Innermeath, descend the family of Stewart of Grandtully, on whom a baronetcy was conferred in 1683.

EARLS OF BUCHAN.—The earldom of Buchan was, in 1469, bestowed on James Stewart, second son of the black knight of Lorn, and brother uterine of James II. By his marriage with the heiress of Auchterhouse, his family became heritable sheriffs of the county of Forfar. His legitimate line ended in the fourth generation in an heiress, Christian, countess of Buchan, who, marrying a son of sir Robert Douglas of Lochleven, carried the earldom of Buchan into his family.

EARLS OF TRAQUAIR.—This James Stewart, first earl of Buchan, had, besides his lawful issue, a natural son, James, legitimated in 1489, on whom his father conferred the lands of Traquair. His descendant, sir John Stuart, was created by Charles I. lord Stuart of Traquair in 1628, and, in 1633, earl of Traquair. The title became extinct or dormant on the death of the eighth earl in 1861.

Various works have been written to elucidate the history of the Stewart family, or particular branches of it, including Symson's *General and Historical Account of the Stewarts* (Edin. 1712); Hay of Drumboote's *Essay on the Origin of the Royal Family of the Stewarts* (1722); Duncan Stewart's *Historical and Genealogical Account of the Royal Family of Scotland, and of the Surname of Stewart* (Edin. 1739); Noble's *Historical Genealogy of the Royal House of Stewart* (Lond. 1795); and Andrew Stuart of Castlemilk's *Genealogical History of the Stewarts* (Lond. 1798), a work full of laborious research, but nearly confined to the houses of Darnley, Lennox, and Castlemilk. See also *The Genealogy of the Stewarts Refuted* (Edin. 1799), and the rejoinder to it in Andrew Stuart's *Supplement to the Genealogical History of the Stewarts* (1799); Chalmers's *Caledonia* (1807—24); Crawford's *Description of the Shire of Renfrew, with Supplement* by George Robertson (Paisley, 1818); Fraser's *Red Book of Grandtully* (Edinburgh, 1868).

STEWART, ALEXANDER, LL.D., 1781—1862; b. Scotland; was minister of Douglas. He published *Cornelius Nepos* with notes; *Mair's Introduction*; *Goldsmith's England*, with continuation; *History of Scotland*; *Stories from the History of Scotland*; *Discourses*; *Compendium of Modern Geography*. He was one of the leading contributors to the *Edinburgh Encyclopædia*.

STEWART, ALEXANDER TURNEY. 1803—76; b. Ireland; educated at Belfast, and at Trinity college, Dublin; came to New York about 1823, and was usher in a private school, but in 1825 engaged in the dry-goods business. In 1841 he married Miss Cornelia M. Clinch; and in 1848—49 erected the magnificent store corner of Broadway and Chambers street, having purchased the property for \$62,000. His business, which was already enormous, continued to extend until it dwarfed all others in the same line in the country; and in 1862 Mr. Stewart found it necessary to follow the tendency toward the upper part of the island, and erected the building corner of Broadway and Tenth street, at a cost of \$2,750,000. To this structure he removed his retail business, confining the lower store to wholesale transactions. In the mean time Mr. Stewart's business comprised agencies in Glasgow, Manchester, Belfast, Paris, Berlin, and Lyons; and mills in the United States at Holyoke, Mass.; New Hartford, N. Y.; Catskill, N. Y..

and in New Jersey. At the time of Mr. Stewart's death, April 10, 1876, his transactions were estimated to exceed \$65,000,000 per annum. He also owned much real estate, including Garden City, L. I., a settlement on Hempstead plains, which has grown to a considerable town; the Metropolitan Hotel and Niblo's Garden, the Globe Theatre; the Park Avenue (formerly the Women's) Hotel, cor. 32d street; and many other buildings and lots in New York; the Grand Union Hotel, Saratoga, etc. Mr. Stewart's residence, corner of Fifth avenue and Thirty-fourth street, contained perhaps the finest private gallery of paintings in the country. Mr. Stewart gave considerable sums in charity during his life-time, including aid to the Irish during the famine of 1847; a ship-load of flour sent to Havre, after the Franco-German war; \$50,000 to Chicago on the occasion of the great fire in 1871; \$100,000 to the U. S. sanitary commission during the war; \$10,000 to the Lancashire, England, operatives who were sufferers by the deficiency of American cotton during the same period; and the Women's Lodging-house in Park avenue; designed by him to be a hotel for young working-women, at low prices, but diverted after his death to the ordinary business of a public hotel, with ordinary rates. Mr. Stewart was buried in the family vault in St. Mark's church-yard, April 13, 1876. The grave was afterward robbed of its contents for the purpose of obtaining a ransom, but it is generally believed that the body was restored to the family, and lies in the mausoleum at Garden City (q.v.). Mr. Stewart bequeathed the sum of \$1,000,000 to ex-judge Henry Hilton, his confidential law adviser; who, with that sum, purchased from the widow her interest in the dry-goods business of A. T. Stewart and Co., which has since been discontinued. Mr. S. ('69) was nominated to the position of secretary of the treasury by President Grant, but the existence of an old law against an importer holding that position prevented his confirmation.

STEWART, BALFOUR, LL.D., b. Edinburgh, 1828; educated at St. Andrew's and Edinburgh. He became director of the Kew observatory, 1859, and professor of natural philosophy in Owens college, Manchester, in 1870. He has published an *Elementary Treatise on Heat; Lessons in Elementary Physics* (1871); *Physics* (1872); and *The Conservation of Energy* (1873). He discovered the law of equality between the radiative and absorptive powers of bodies. With Prof. Tait, he wrote *The Unseen Universe*. D. 1887.

STEWART, CHARLES, 1778-1869; b. Philadelphia; became a lieutenant in the U. S. navy in 1798. In 1800, in command of the schooner *Experiment*, he captured the French privateer *Deux Amis*, and the *Diana*. In 1804, in command of the *Siren*, he went with the American squadron against Tripoli. He was made capt. in 1806, and in 1813, on the frigate *Constitution* captured several British vessels. In 1815, after a fight lasting 1 hour and 40 minutes, he captured the British ships, *Cyane*, 34 guns, and the *Levant*, 21 guns; but the latter was recaptured. He was in command of the Mediterranean squadron, 1816-20, and the Pacific squadron, 1821-23. He became rear-admiral on the retired list in 1862.

STEWART, CHARLES SAMUEL, b. N. Y. 1795; graduated at Princeton college, 1815; studied law at Litchfield, Conn., and theology at Princeton; ordained a missionary to the Sandwich islands, 1822; visited the United States, 1826; appointed chaplain in U. S. navy, 1828; was chaplain of naval station New York, 1836-37. He published *Private Journal of a Voyage to the Pacific Ocean and Residence at the Sandwich Islands, 1823-25; Visit to the South Seas in U. S. Ship Vincennes, 1829-30; Sketches of Society in Great Britain and Ireland*. He d. 1870.

STEWART, DUGALD. This philosopher was b. in Edinburgh, on Nov. 22, 1753. His father was Matthew Stewart, professor of mathematics in the university of Edinburgh. He entered the high school in his eighth year, and remained till his thirteenth. During the last two years of his attendance, when in the rector's classes, he was principally under Alexander Adam, afterward well known for his classical scholarship, who then began to teach as the rector's substitute. His subsequent course at the university extended from 1765 to 1769. In the departments of study where his own career afterward lay, he was fortunate to find professors of ability and distinction; the logic chair was filled by John Stevenson, who lectured on logic, metaphysics, rhetoric, and the history of philosophy; the moral philosophy chair was occupied by Adam Ferguson. While Stewart gave his highest promise in these subjects, he also made great attainments in mathematics and natural philosophy, and likewise in classics. In 1771 he went to study at Glasgow, partly with a view to one of the Snell scholarships at Balliol college, Oxford, and partly to attend the lectures of Dr. Reid. It was while there that he wrote an essay on dreaming, which was his first effort in mental philosophy, and contained the germs of many of his subsequent speculations. He lived in the same house with Archibald Alison, the author of the *Essay on Taste*, and the two became intimate friends through life. He was at Glasgow only one session. In 1772, in his 19th year, he was called upon by his father, whose health was failing, to teach the mathematical classes in the university of Edinburgh; in 1775 he was elected joint professor, and acted in that capacity till 1785. In 1778 Adam Ferguson was absent from his post on a political mission to America, and Stewart taught the moral philosophy class in addition to his mathematical classes. The lectures that he gave on this occasion were wholly his own, and were delivered from notes, as was his practice in after years. On the resignation of

Ferguson in 1785 he was appointed professor of moral philosophy, and continued in the active duties of the class for 25 years. His lectures were greatly admired and numerous attended. He went over a wide compass of subjects: psychology, or the science of mind proper, metaphysics, logic, ethics, natural theology, the principles of taste, politics, and last of all, political economy, which, from the year 1800, he treated in a separate course. In 1792 appeared his first volume of the *Elements of the Philosophy of the Human Mind*. In 1793 he published his *Outlines*. He read before the Royal Society of Edinburgh, in 1793, his *Account of the Life and Writings of Adam Smith*; in 1796 the *Account of the Life and Writings of Principal Robertson*; and in 1802 the *Account of the Life and Writings of Dr. Reid*. In 1805 he took a prominent part in the Leslie controversy; being the author of a pamphlet setting forth the facts of the case, and also, in the general assembly, giving vent to his indignation at the proceedings against Leslie. In 1806, on the accession of the whig party to power, he received a sinecure office worth £300 a year. The death of his second son, in 1809, gave a blow to his health, otherwise indifferent, and he was unable to lecture during part of the following session; Dr. Thomas Brown, at his request, acting as his substitute. The following year Brown was appointed conjoint professor, and taught the class till his death in 1820. From 1809 Stewart lived in comparative retirement at Kinneil house, Linlithgowshire, which the duke of Hamilton placed at his service. In 1810 he published his *Philosophical Essays*; in 1814 the second volume of the *Elements*; in 1815 the first part, and in 1821 the second part, of the *Dissertation on the History of Ethical Philosophy*; in 1827 the third volume of the *Elements*; and in 1828, a few weeks before his death, the *Philosophy of the Active and Moral Powers*.

On the death of Brown, Stewart exerted himself to secure the appointment of sir W. Hamilton to the chair, but the influence used with the town council in behalf of John Wilson was overpowering; the votes stood 21 for Wilson, 9 for Hamilton. Stewart resigned his conjoint professorship on June 20, 1820.

The philosophy of Stewart was the following up of the reaction commenced by Reid against the skeptical results that Berkeley and Hume drew from the principles of Locke. Both Reid and Stewart professed the Baconian method of observation and induction, as against mere ontology, but considered that these processes of investigation could establish certain ultimate truths of a higher certainty than themselves. Hence arose the principles of common sense of Reid, in which Stewart for the most part acquiesced. Stewart also followed and improved upon Reid in that systematic exposition of all the powers of the mind, which rendered mental philosophy for the first time a subject of study, independent of metaphysical, logical, and ethical applications; although he also followed it out in all these directions with his usual perspicacity and felicity of exposition. His contributions to the philosophy of taste, in the *Philosophical Essays*, are among the best parts of his writings.

On the whole, although Stewart was not one of the most original thinkers in his department, yet, by the force of his teaching and the compass of his writings, he did more than almost any man to diffuse an interest in the speculations connected with the human mind. His collected works have been edited by sir W. Hamilton, in 11 vols., to which Prof. Veitch has contributed his biography.

STEWART, HAMILTON, b. Jefferson, Ky., 1813; established *The Civilian*, a newspaper in Texas, 1838, and conducted it in the interest of the democratic party for more than 30 years. He resided in Galveston, was mayor of the city for several years, and its representative in the constitutional convention of 1856. He favored the independence of Texas, and opposed annexation; collector at Galveston under Pres. Pierce and Pres. Buchanan; lost his position during the war. He was persistently opposed to secession for years previous to the civil war. As one of the editors of the *Galveston News* he has exerted a marked influence on the politics of the s. west.

STEWART, JOHN, b. Ireland, d. Charleston, S. C.; brother-in-law of Gen. Wayne; performed gallant service in the revolutionary war at Stony Point, and received a gold medal from congress. In 1778 he commanded a corps of light infantry at Indian Field, against Col. Emmerick's command of tories and Indians; was killed by a fall from his horse.

STEWARTON, a town of Scotland, county of Ayr, on the right bank of the Annock, five miles n.w. of Kilmarnock, and nominally a station on the Glasgow and South-Western railway, although the place called *Stewarton Station* is several miles distant from the town. Stewarton owes its prosperity to its woolen and Scotch bonnet manufactures; but it also carries on a variety of minor industries, such as carpet-weaving, Ayrshire needle-work, and the making of spindles for mills. Pop. '91, 2687.

STEWARTRY, the name which was given in Scotland to a district governed by a steward, an officer appointed by the king with jurisdiction over crown lands, and powers similar to those of a lord of regality. While the civil jurisdiction of a steward was equivalent to that of a sheriff, his criminal jurisdiction was much more extensive. The only remaining trace of this jurisdiction exists in the term *stewartry*, which in place of county is applied to the district of Kirkcudbright. Galloway was in early times rather a tributary dependency of Scotland than an integral portion of the kingdom, and retained its old Celtic proprietary, and peculiar laws and usages, which were adverse to

the introduction of a sheriffdom. It was for a long time ruled by a line of lords, who were among the most powerful feudatories of the Scottish crown. The Comyns, who in the course of time succeeded to the lordship, were overthrown and expatriated by Bruce; and it seems to have been on their forfeiture that eastern and central Galloway were erected into the present stewartry, western Galloway being already under the jurisdiction of the sheriff of Wigton. On the abolition of heritable jurisdictions in 1747, various regalities and baronies which had existed within the district were done away with, and the emancipated stewartry was placed under a steward-depute, whose functions were in every practical point of view the same as those of a sheriff-depute. Act 1 Vict. c. 39, declares that in any existing or future statute the words sheriff, sheriff-clerk, etc., shall be held to apply to steward, steward-clerk, etc.

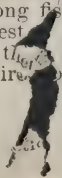
STEWING, in cookery, a very economical way in preparing meat and fruits for food. It differs from boiling in this respect, that only a small quantity of water is used, and the heat applied is so gentle as only to *simmer* it. A stew-pan should be well fitted with a lid, and the more slowly the ebullition is carried on the better. As the small quantity of water is retained as gravy, nothing is lost. Meat prepared in this way is tender and savory, but owing partly to the richness of the gravy is not very digestible.

STEYER, a town of upper Austria, at the confluence of the Steyer and the Enns, 23 miles s.e. of Linz. It is a great seat of the iron and steel manufactures of Austria, and also carries on important manufactures of paper, woolens, and hosiery. Pop. '90, 21,499.

STHAVIRA (a Sanskrit word, meaning *old*) is, in Buddhist hierarchy, the name of the "elders" or "venerables," who, after the death of the Buddha S'âkyamuni, taught the doctrine, presided at the Buddhist assemblies, etc., and since the time of As'oka were invested with a kind of episcopal power. In the sectarian history of Buddhism, Sthavira is the name of those Arhats who did not follow the schism of the Mahâsângghikas (q.v.), but adhered to the old doctrine. According to another account, the Sthaviras are one of the four divisions of the Vaibhâshika system of Buddhism, and claim for their founder Kât'yâyana, the disciple of S'âkyamuni.—See C. F. Koeppen, *Die Religion des Buddha* (Berlin, 1857); and W. Wassiljew, *Der Buddhismus, seine Dogmen, Geschichte und Literatur* (St. Petersburg, 1860).

STICKING-PLASTER, or **COURT-PLASTER**, is best prepared in the following manner: Two solutions are first made, one of an ounce of isinglass in eight ounces of hot water, and the other of two drams of gum-benzoin in two ounces of rectified spirit. These solutions are to be strained and mixed. Several coats of this mixture, kept fluid by a gentle heat, are then to be applied with a camel's-hair brush to a piece of black silk stretched on a frame, each coat being allowed to dry before the next is applied. A layer of a solution composed of one ounce of Chian turpentine in two ounces of tincture of benzoin is then to be applied to the other side of the silk, and allowed to dry. In place of the ordinary black sticking-plaster, some persons prefer colorless plaster, or *gold-beater's skin* (q.v.).

STICKLEBACK, *Gasterosteus*, a genus of acanthopterous fishes, referred by many naturalists to the family of mailed cheeks (q.v.) (*sclerogenidæ* or *triglidæ*); by others, to a distinct family (*gasterosteidæ*), in which the first dorsal fin is represented by a number of detached spines, a single strong spine occupies the place of the ventral fins, there are only three branchiostegal rays, the gill-covers are not armed, and the body is mailed by plates on the lateral line, and destitute of scales. The species are found in fresh and brackish waters, and in the sea, in cold and temperate regions; and are small fishes, very interesting from their habits and the beauty of their colors, which they change in a remarkable manner, partly according to the colors of surrounding objects, and partly through the influence of their own passions. The **THREE-SPINED STICKLEBACK** (*G. aculeatus* or *trachurus*), having three spines instead of the first dorsal, is extremely abundant in rivers, ponds, and brackish waters in most parts of Britain and of Europe, and is sometimes also found in the sea. Sticklebacks caught in a river readily accommodate themselves to living in a salt-water aquarium. It seldom exceeds two inches and a half, or three inches in length. Cuvier and Valenciennes, Yarrell, and others, distinguish from this several other species, some of which are also British, differing in size, the armature of the sides, and other particulars (4 to 15 spines); but some naturalists are still inclined to regard them as mere varieties. The common fresh-water species are sometimes so abundant in ponds, ditches, and the still parts of rivers, as in Lincolnshire and other flat parts of the e. of England, that they are used for manure. They are seldom used as food, yet they are said to be excellent for this purpose. Oil has sometimes been expressed from them. In the aquarium, or in their native waters, their combats are very amusing. They are excessively pugnacious, particularly at the breeding season. The larger often devour the smaller, and they destroy the fry of fishes to a prodigious extent; they feed also on aquatic larvæ, and are probably of great use in preventing the excessive multiplication of many kinds of insects. Their nest-building is particularly interesting, and in them nest-building was first observed among fishes. They collect small pieces of straw or stick, with which the bottom of the nest is laid among water-plants, and these they cement together by an exudation from their own bodies which forms a thread through and round them in every conceivable direction. The thread is



whitish, fine, and silken. The sides of the nest are made after the bottom. The nest of the fresh-water stickleback is about the size of a small hazel nut. The eggs, about the size of poppy-seeds, are deposited within. The male makes the nest, into which he introduces the female for the laying of the eggs, and he afterward watches it with great care—a care not unnecessary, as the eggs are most acceptable food to any other stickleback which can get at them. See *illus.*, FISHES, vol. VI.

STIFF-NECK (known also as **WRY-NECK** or **TORTICOLLIS**) is the term commonly applied to a condition of the neck in which lateral movement of the head causes great pain, and which is due to rheumatism of the muscles lying on the side of the neck, especially the sterno-mastoid. In the great majority of cases, only one side of the neck is affected, the head being drawn more or less obliquely toward that side; but occasionally both sides are equally attacked, in which case the head is kept stiffly erect and looking straight forward. As long as the head is allowed to remain at rest, there is merely a feeling of discomfort; but every movement is extremely painful. This affection is usually caused either by exposure of the part affected to a current of cold air, or by wearing wet or damp clothes round the neck. In addition to the ordinary treatment of sub-acute rheumatism (q.v.), heat may be advantageously employed, either, as suggested by Dr. Wood of Philadelphia, by placing a batch of carded tow or cotton over the part, and then applying a hot flat-iron, or by the direct application of a small heated iron hammer, as recommended by Drs. Corrigan and Day.

STIGMA. See **PISTIL**.

STIGMARIA, the root of *sigillaria* (q.v.).

STIGMATA MAIDIS, the green silk of Indian corn from which an extract is made by macerating it without the use of heat. It medical use is to increase the flow of urine; it also exerts a regulating influence upon the heart, and is valuable in cases of heart disease accompanied by dropsical effusions.

STIGMATIZATION (Lat. *stigmatizatio*, a puncturing, from Gr. *stigma*, a puncture), the name applied, by the mystic writers of the Roman Catholic church, to the supposed miraculous impression on certain individuals of the "stigmata," or marks of the wounds which our Lord suffered during the course of his passion. These stigmata comprise not only the wounds of the hands and feet, and that of the side, received in the crucifixion; but also those impressed by the crown of thorns and by the scourging. The impression of the stigmata, being held to be miraculous, was regarded as a mark of the signal favor of our Lord, manifested to those who were specially devoted to the contemplation of his passion. The most remarkable example of stigmatization is that already referred to in the memoir of Francis of Assisi (q.v.), which is said to have occurred on the mountain of Alverno, upon Sept. 15, 1224, two years before the death of Francis. Being absorbed, according to the account of his biographers, in profound and rapturous contemplation of the passion of Christ, he saw, as it were, a seraph with six shining wings, blazing with fire, and having between his wings the figure of a man crucified, descend from heaven, and approach him, so as to be almost in contact. After a time the vision disappeared, but left the soul of Francis filled with reverence and awe; and on his return to calmer thought, he became aware that his body had received externally the marks of the crucifixion. His hands and feet seemed bored through with four wounds, and these wounds appeared to be filled with nails of hard flesh, the heads of which protruded and appeared upon the palms of his hands, and on the instep, while the points protruded upon the opposite side, and seemed as if clenched with a hammer. His side, moreover, presented a red wound, as though from the point of a lance, and this wound occasionally gave forth blood. These mysterious marks continued, and were frequently seen by St. Bonaventure and others during the two years which intervened between this date and the death of Francis; and they were seen by multitudes after his death.

It would be out of place here to enter into any discussion as to the origin, or the nature, of this strange phenomenon. But the case of Francis of Assisi is not a solitary one; very many others, women, as well as men, are recorded as having received all or some of the stigmata. The cases of women so visited are more numerous than those of men. A very remarkable one is that of Veronica Giuliani, in 1694, who is related to have received first the marks of the crown of thorns, and afterward those of the crucifixion; Gabriella da Piezolo of Aquila is recorded to have received the mark of the lance in 1472; Clara di Pugnny, a tertiary of the Dominican order, was similarly impressed in 1514; and Cecilia di Nobili of Nocera in 1655. Catherine di Raconisio is alleged to have been marked with the crown of thorns in 1583, and the same is related of several others, as Maria Razzi of the island of Chio, Maria Villani, Vincenza Ferreri of Valencia, and Joanna Maria of the cross, a nun of St. Clare, at Roveredo. In some cases, the visitation, although said to be accompanied with excruciating pain in the seat of the several wounds, was unattended by any external marks. Such was the case of St. Catherine of Siena, of Ursula Aguirre—otherwise known as Ursula of Valencia—of Mary Magdalen di Pazzi, and of Mechtildis von Stanz; while in other cases the wounds were in part visible, and in part invisible. Thus, Hieronyma Carvaglio suffered the pain of the wounded hands and feet without any external mark, while the lance-wound was not only visible in her side, but was reported to bleed upon every Friday, the day specially devoted to the commemoration of the passion. Blanca de Gazeran experienced the

sensation of pain in the seat of each one of the wounds, but the mark of the nail was visible upon the right foot only. The same variety of sensation is recorded in several other cases.

Most of the cases recorded hitherto are of females; and that examples of these are not wanting even in more recent times, the case of the well-known "Estatica" of Caldaro, about 40 years ago, and that of Louise Lateau, discussed quite recently, sufficiently attest. But, besides that of Francis of Assisi, instances are also recorded in which men were reputed to have received the stigmata. A Capuchin named Benedict, of Reggio, is said to have received the marks of the crown of thorns in 1602. A lay-brother named Carlo di Saeta, or Sazia, was smitten in a vision with the wound in the side. Angelo del Paz, a Franciscan of Perpignan, is related to have borne for many years all the stigmata, as also a Premonstratensian monk named Dodo, and a Franciscan called Nicholas of Ravenna. Several cases also are mentioned of men, who, without the visible or external stigmata, experienced at regular intervals the painful sensation by which the stigmata are accompanied. Many such cases are detailed by the celebrated German mystic, Görres, in his *Christliche Mystik*, vol. ii. pp. 420-456.

STILAGINA CEE, a natural order of exogenous plants, allied to *urtica*, containing about 20 known species of trees and shrubs, natives of the East Indies, Mauritius, and Madagascar. None of them are of importance.

STILBITE. See **ZEOLITE**.

STILES, EZRA, D.D., LL.D., 1727-95; b. Conn.; graduated at Yale college, 1746; tutor there, 1749-55; licensed to preach, 1749, and preached to the Stockbridge Indians; was induced by ill health and transient religious doubts to study law, 1752; admitted to the bar, 1753, and practiced in New Haven; settled pastor at Newport, R. I., 1756; on the place being occupied by the British, removed to Portsmouth, and was pastor of North church; elected president of Yale college and professor of church history, 1778, retaining the positions until his death. After the death of Dr. Daggett, 1780, he was professor of divinity, and gave lectures on philosophy and astronomy. He published *History of Three of the Judges of Charles I.*; *Account of the Settlement of Bristol*, and numerous addresses and sermons. His *Diary* and bound manuscripts, preserved at Yale, fill 45 volumes.

STILICHO, FLAVIUS, a Roman gen., the mainstay of the western empire after the death of Theodosius (q.v.) the Great, is said to have been a Vandal, and was the son of a capt. of barbarian auxiliaries in the imperial army. He rose through his military talent to high rank in the army, and Theodosius was so pleased with his rare ability, zeal, and accomplished manners, that he gave him his niece Serena in marriage. Stilicho's promotion was, however, viewed with great jealousy by Rufinus, the able but evil-minded and ambitious minister of Theodosius, and an inextinguishable feud arose between the two, which it required all the weight of the emperor's influence to repress. In 394 Stilicho departed for Rome in charge of the youthful Honorius (q.v.), who had been committed to his care, placed him on the throne of the western empire, and administered in his name the affairs of state. On the death of Theodosius, toward the close of 394, the quarrel for supremacy between Stilicho and Rufinus, the guardian of Arcadius (q.v.), became fully developed, and Alaric (q.v.), at the instigation of the latter, invaded Greece while Stilicho was engaged in chastising the invaders of the Roman territories on the Rhine and in Gaul. Stilicho, on his return, at once set out for Constantinople, and put an end to the struggle between himself and Rufinus by the destruction of his rival in 395. He then marched against Alaric, blocked him up in the Peloponnesus; but, through over-confidence, permitted him to escape across the isthmus with his captives and booty. In 398 his daughter Maria became the wife of Honorius. His old opponent, Alaric, after several inroads upon the eastern provinces of the western empire, now invaded northern Italy, but was signally defeated at Pollentia (Mar., 403) by Stilicho, who had hurriedly called in the Roman legions from Rhetia, Gaul, Germany, and even Britain. He was again defeated at Verona, upon which he retired from the empire, and Stilicho obtained the honor of a triumph and a great increase of influence and power. Stilicho's ambition now led him to attempt the introduction of his own family to the imperial succession (a statement disbelieved by Gibbon, who considers it merely as an invention of the crafty Olympius; though the great historian of the Roman empire honestly confesses to various heavy blots on the character of his hero), by the marriage of his son with the heir-presumptive Placidia, the daughter of Theodosius, and to attain this end, he made overtures of alliance to Alaric, which were gladly accepted. But the dreadful inroad of Radagaisus, in 406, at the head of more than 200,000 (some say 400,000) barbarians, who ravaged the whole country as far as Florence, compelled the great gen. of the west to shelve for a time his ambitious schemes. With a small but chosen army of veterans, aided by a body of Huns under Uldin (father of Attila), and of Visigoths under Sarus, he so harassed the invaders that they were forced to give him battle. They were soon routed. Radagaisus, who surrendered, was put to death, and his followers sold as slaves. Stilicho again resumed his pet scheme; established enmity between Rome and Byzantium by seizing on eastern Illyricum and inducing Alaric to transfer his allegiance to Honorius. But Honorius, who had been prejudiced against Stilicho by one of his officers, Olympius, refused to take eastern Illyricum from the Byzantine empire; and subsequently, by an artful harangue, he so influenced the soldiers of the army of Gaul that they rose en

masse against the partisans of Stilicho. Stilicho himself was at Bologna; and on the news of the *émeute*, his most zealous friends urged immediate action against Olympius and the Pavian rebels; but for the first time in his life, vacillation seized Stilicho, and he declined. They then, for self-preservation, turned against him, and one of them, Sarus, the Goth above mentioned, drove him out of his camp, and compelled him to flee to Ravenna, where he was soon afterward slain, Aug. 23, 408. Thus perished the last of the series of distinguished aliens, who, as emperors, warriors, or politicians, had propped up the Roman empire for 150 years, with a stern and resolute zeal equal to that of the early Romans themselves. After protecting the weak empire from formidable invasion by his own kinsmen, administering its affairs with remarkable ability, moderation, and integrity, and restoring its old heroic glory to the imperial arms, Stilicho received the reward which alone an effete and conceited people can be expected to bestow; and three months after his death, Alaric and his Visigoths were at the gates of Rome.

STILL is the apparatus employed for the distillation of liquids, and consists of the copper boiler or *alembic* (see DISTILLATION), in which is contained the fermented liquor whose vapors are to be distilled; of the *neck* or *head*, a pipe which conveys the vapor generated in the boiler into the worm; and of the *worm*, a coiled metal tube which is packed in a vessel called a *refrigeratory*, fitted up in such a manner that the cold water which is poured in at the top comes in contact as extensively as possible with the outside of the tube, and exercises a condensing action upon the vapor which it contains. The vapor thus condensed in its passage through the worm, makes its exit in drops, or in a small stream, into a vessel called the *recipient*, and may be redistilled or not as is required. The various forms of stills are extremely numerous, almost each species of spirit possessing its own form of still, but they all conform to the general description above given.

STILL, JOHN. An English prelate, born at Grantham, Lincolnshire, about 1543. He was educated at Christ's College, Cambridge. He became successively Margaret Professor of Divinity at Cambridge (1570), Prebendary of Westminster (1573), Master of St. John's College, Cambridge (1574), Archdeacon of Sudbury (1576), Master of Trinity College, Cambridge (1577), and Bishop of Bath and Wells (1592-93). He died in 1607. He is supposed to be the author of *A Ryght Pithy, Pleasant and Merie Comedie, intytuled Gammer Gurton's Needle*, the third English comedy, containing the first good English drinking ballad of which the chorus runs, "Backe and side go bare, go bare," etc., for which see Washington Irving's sketch of "Little Britain" in his *Sketch Book*.

STILLÉ, ALFRED, b. Philadelphia, 1813; an American physician. After graduating at the university of Pennsylvania in 1832 he became resident physician of the Philadelphia hospital, and in 1839-41 of the Pennsylvania hospital. He attended medical lectures in Paris and other European cities, and in 1844 became lecturer on pathology and practice of medicine to the Philadelphia association for medical instruction. In 1849 he was made physician to St. Joseph's hospital, soon afterward professor in the Pennsylvania medical college, and from 1864 to 1884 he lectured in the university of Pennsylvania. He wrote among other books *Elements of General Pathology and Therapeutics* and *Materia Medica*.

STILLÉ, CHARLES JANEWAY, LL.D., b. Philadelphia, 1819; graduated from Yale college in 1839; was made professor of English literature in the university of Pennsylvania, 1866; and provost, 1868, from which office he retired in 1880. He has published *How a Free People Conduct a Long War* (1862); *Northern Interest and Southern Independence* (1863); *The Historical Development of American Civilization* (1863); *Memorial of the Philadelphia Central Fair for the U. S. Sanitary Commission*; *History of the U. S. Sanitary Commission* (1866); *Studies in Mediæval History*, 1880.

STILLINGFLEET, EDWARD, bishop of Worcester, was b. April 17, 1635, at Cranbourne, in Dorsetshire. He received his early education at the grammar-school of his native place, and in 1648 became a student at St. John's college, Cambridge. He took his degree as master of arts; and in 1653 succeeded in obtaining a fellowship. For some years after leaving college he was occupied as a private family tutor; and in 1657 he was presented to the rectory of Sutton. In 1659 he came before the world as an author in the work entitled *Irenicum, or the Divine Right of Particular Forms of Church Government Examined*. The views here maintained savored somewhat more of latitudinarianism than could be pleasant to the high church party, and he afterward saw reason to modify them. His next performance was the *Origines Sacre, or Rational Account of the Christian Faith, as to the Truth and Divine Authority of the Scriptures*, a work which made his reputation, and is still had in estimation as one of the most masterly treatises extant on the subject of which it treats. In 1664 appeared his *Rational Account of the Grounds of the Protestant Religion*, a defence of the church of England from the charge of schism in its separation from that of Rome, which was received with great favor, and led to the preferment of its author. In 1665 the earl of Southampton presented him to the rectory of St. Andrews, Holborn; he was also appointed preacher at the rolls chapel, and shortly after lecturer at the temple, and chaplain in ordinary to Charles II. In 1670 he became, by favor of the king, canon residentiary of St. Paul's cathedral, and in 1678 was preferred to be dean of the same. In the court of ecclesiastical commission instituted by James II., Stillingfleet declined to act; and after the revolution of 1688 he received, in final acknowledgment of his services to the Protestant cause, his appointment to the bishopric of Worcester. He died at Westminster on Mar. 27, 1699.

Stillingfleet's chief works, besides those mentioned, were the *Origines Britannicæ*, or *Antiquities of the British Churches*, and a bulky volume entitled *The Unreasonableness of Separation*, in reply to an attack made upon him by Howe and others. Throughout, he was besides almost constantly engaged in religious controversy, on the one hand with the adherents of the church of Rome, and on the other with the Nonconformists.

STILLING-GIA, a genus of plants belonging to the natural order *euphorbiaceæ*, and named in compliment to Dr. Stillingfleet, an English botanist. The generic characteristics are: flowers monœcious; males aggregate; calyx cup-shaped, crenulate, or bifid; stamens two, inverted; filaments united at the base; anthers opening outward; female flowers solitary; calyx tridentate or trifid; ovary sessile, three celled, each cell with a single ovule; style short, thick; stigmas three, simple, spreading; capsule globose, tricoccus; cocci single-seeded. The species are milky trees or shrubs of the tropical parts of Asia and America, and of the islands of Bourbon and Mauritius. The leaves are alternate, petiolate. The *stillingia sebifera* is the famous tallow tree of China, which at one time was introduced into various European colonies in the East and West Indies, and is often met with in hot-houses. It grows in China on the borders of rivulets, and is also cultivated. It is about as high as a pear-tree, having a trunk and branches like the cherry, and foliage resembling that of the black poplar, but which turns red in the autumn. The fruit is the part from which the Chinese obtain the tallow.

STILL-LIFE is the name applied to that branch of art which concerns itself with the representation of lifeless objects, such as dead animals, fruits, flowers, vases, and house-furniture.

STILLMAN, SAMUEL, D.D., 1738-1807; b. Philadelphia; ordained in Charleston, S. C., as an evangelist, 1759; preached for a time at James island; removed to Bordentown, N. J., 1760; settled, 1765, as pastor of the First Baptist church, Boston, remaining till his death. In 1764 he was one of the incorporators of Brown university, and elected fellow the following year. He was distinguished for patriotism, and was a delegate to the Mass. constitutional convention, 1788. He published patriotic, masonic, and biographical discourses, and "election" sermons.

STILLMAN, WILLIAM JAMES, b. N. Y., 1828; an artist and littérateur; graduate of Union college, 1848; studied landscape painting in New York and France. He was art editor of the *Evening Post*, 1853-4, and also in 1883. He was U. S. consul at Rome, 1861-65; at Crete, 1865-69; author of a number of works on Greek archæology and art.

STILLWATER, city and co. seat of Washington co., Minn.; on the St. Croix river and lake, and the Chicago and Northwestern, the Chicago, Milwaukee, and St. Paul, the Chicago, St. Paul, Minneapolis, and Omaha, the St. Paul and Duluth, and the Wisconsin Central railroads; 18 miles n.e. of St. Paul. North of the city is the St. Croix boom, through which about 300,000,000 feet of pine logs are passed annually. The city is the seat of the state penitentiary, and has a high school, public library, hospital, opera houses, a bridge across the head of the lake, electric lights and street railroads, water-works supplied chiefly from springs, national and savings banks, about 12 churches, and daily and weekly newspapers. The principal industries are those connected with lumbering. There are many points of local interest, including the Sioux-Chippewa battlefield, painted rocks, and picturesque bluffs. Pop. '90, 11,260.

STILTED ARCH, an arch in which the impost molding is placed at some distance below the springing of the arch.

STILTS (Dutch, *stelts*), are long sticks or crutches on which a person may stand when walking, in order to increase the length of stride. In the western part of Landes, in south-western France, they are of great use to a few poor people who live there on great plains made up of swamps and sand dunes, and whose sole occupation is the care of small flocks of sheep or herds of swine on these plains. For this purpose they use long stilts that are strapped firmly to the leg, while in the hand they carry a long pole to assist them in walking. This pole also has a cross-piece on one end something like a crutch, and by putting it behind him on a slant, a person may use it as a stool, to sit upon and rest, and when seen at a distance, look not unlike a huge tripod, or three-legged stool. Women use these stilts as well as the men, and may often be seen sitting in this manner and knitting as they watch the flocks.

STILTS, or **STILT PLOVERS**, the common names of a genus, *himantopus*, of the snipe family, *scelopacidae*, of the order *grallatores*. The stilts have long, slender bills, cylindrical, flattened at the base, compressed at the point; both mandibles channelled to the extent of half their length from the base; nostrils lateral, linear; tarsi very long and slender; toes three, before; nails small and flat; wings very long, the first quill-feather the longest. *Himantopus melanopterus* (charadrius *himantopus* of Linn.) *cavaliere grande Italiano* of the Italians, *Schwarzflügelige strandreuter* of the Germans, long-legged plover, stilt, and longshanks of the English, has face, neck, and all lower parts pure white, slightly rosy on the breast and belly; top of head and neck black, with white spots; back and wings black, glossed with green; tail ash-color; bill black; iris crimson; feet vermilion; length from point of bill to end of tail 14 in., and to the claws about 19 in. The very old males have the nape of neck and occiput quite white. Female smaller

than male, and having no green gloss on shoulders; general tint browner. Six species of *himantopus* are recognized by G. R. Gray as inhabitants of various parts of the world. One species is found in America, ranging from the great lakes to Paraguay. It is about 14 in. long, the bill and tail each forming 3 in., leaving 8 in. for the body: tarsi 4 in., rather longer than the tibiae; glossy black on back, wings, top of head, and neck. White above, beneath, and in front of the eyes: bill black; legs red. It is found along the sea-coast, and also along lakes and rivers far inland; gregarious, in flocks of twenty and thirty, or more. They frequent muddy flats with reedy margins, making nests of grasses. Four eggs is the most frequent number laid for a brood; they are rather large, of an ochrey color, with brown blotches and streaks. The birds are graceful walkers, with long, measured steps. They live on small fishes and their eggs, and aquatic insects. Although the bird is widely distributed it is rare. Its visits are accidental and uncertain. It is scarce in the northern portion of Europe, but its wide range makes up for its local scarcity.

STIMPSON, WILLIAM, 1832-72; b. Mass.; studied medicine, and made a specialty of conchology. Among his writings, besides many papers in the *Smithsonian Contributions*, and scientific periodicals, are *Revision of the Synonymy of the Testaceous Mollusks of New England* (1851); *Notes on North American Crustacea* (1859); and *Researches upon the Hydrobiinae and Allied Forms* (1865).

STIMULANTS may be defined as agents which produce a sudden, but not a permanent, augmentation in the activity of the vital functions. They give increased energy to the circulatory and cerebro-spinal nervous systems, the primary effect being probably on the nervous system, while the circulation is only secondarily affected. In their mode of action they resemble tonics (q.v.) in some respects; thus immediately after their administration a feeling of increased power is produced, which, however, is not permanent, and is almost always followed by a corresponding depression of vital power; their effects are, however, more immediate than those of tonics. Many of these agents, as, for example, alcohol and the ethers, are closely allied to narcotics, their secondary effect, if given in sufficiently large doses, being to produce sleep, and even coma. The following are the most important of the general stimulants: 1. *Alcohol*, in the various forms of spirits and wines. As a stimulant, alcohol is employed in medicine to support the vital powers in the advanced stages of fevers, particularly those of a low or typhous character; and it is of service in flatulent colic, in some forms of indigestion, in vomiting, and in fainting. Its almost universal use in inflammatory diseases occurring in persons of broken-down constitution has recently been advocated by a special school, of which the late Dr. Todd may be considered a representative. In cases of severe uterine hemorrhage and in some forms of fever, it may be given in very large quantity. According to Neligan, in the fever which proved so fatal to the British legion in Spain in the year 1835, some of the physicians prescribed as much as 32 ounces of brandy (a pint and a half) in 24 hours. 2. *Ammonia*, either in the form of *solution of ammonia*, or *liquor ammonia*, or as *carbonate of ammonia* is a general stimulant, whose action is rapid, but temporary. It is of special use in the advanced stages of continued fever, in the eruptive fevers when the rash has receded (especially in scarlatina), and in the latter stages of pneumonia. It is the best internal stimulant to employ in profound intoxication, and in cases of poisoning by sedatives; and as an external stimulant, the vapor is inhaled in cases of fainting. The solution (which must not be confounded with the *strong solution of ammonia*) may be given in doses of from 5 to 30 minims, diluted with two ounces of water, mucilage, or any bland fluid. The *carbonate* (formerly known as the sesquicarbonate, which in reality it is) may be given in doses varying from 3 to 10 grains in pills or in cold water. The *aromatic spirit of ammonia*, containing both ammonia and its carbonate, is an excellent and agreeable stimulant in fainting, hysteria, flatulent colic, etc., in doses of from half a dram to a dram, taken in water or camphor mixture. 3. *Cajeput oil*, in doses of from 2 to 6 drops on a lump of sugar, or rubbed up with sugar, is a powerful diffusible stimulant, admirably suited for cases of flatulent distention of the stomach and intestines. 4. *Ether* (known also as *sulphuric ether*) acts as a general diffusible stimulant; but its effects, which are rapidly produced, are very transient. It is chiefly employed as a stimulant in spasmodic and nervous affections unaccompanied by inflammation, as "in cramp of the stomach, in spasmodic or flatulent colic, in nervous palpitations, in hiccough, in nervous headache, during a paroxysm of spasmodic asthma, in aphonia, etc. It is also administered frequently with good effect in the advanced stages of fever, when the twitching of the muscles, known as *subsultus tendinum*, and hiccough are present; and as an immediate stimulant in fainting and asphyxia."—Neligan's *Medicines*, etc., 6th ed. p. 452. It is usually given in doses of about a dram in some aromatic water. To these more important stimulants may be added camphor, ginger, horse-radish, the preparations of lavender, of the mints, etc. It must not be forgotten that electricity, galvanism, and magnetic electricity operate on the animal system either as general or local stimulants, according to the manner in which they are applied. See ELECTRICITY, MEDICAL.

STINDE, JULIUS ERNST WILHELM, German author, was born at Kirch-Nüchel in Holstein, Aug. 28th, 1841. Having studied chemistry and natural philosophy, he was for some years after 1863 employed as a chemist in Hamburg. He then accepted the editorship of the *Hamburger Gewerbeblatt*, and finally devoted himself entirely to litera-

ture, at first writing principally upon subjects in natural philosophy. Beside numerous contributions to periodical literature, he published: *Blicke durch das Mikroskop* (1869); *Alltagsmärchen: Novellen* (1873); *Naturwissenschaftliche Plaudereien* (1873); *Die Opfer der Wissenschaft* (under the pseudonym Alfred de Valmy (1879); *Aus der Werkstatt der Natur* (1880, 3 vols.); *Das Rauchen* (1881); *Waldnovellen* (1881; 10th ed., '89); *Die Wandertruppe, oder, das Dekameron der Verkannten* (2nd ed., 1886); *Die Perlenschnur* (1887). A series of several volumes, purporting to be written by one Wilhelmine Buchholz, and which dealt with the life of the middle classes in Berlin became very popular, both in the original and in the English translations, and brought his name prominently before the general public. These volumes, some of which ran through fifty or more editions, include: *Die Familie Buchholz* (1884); *Die Buchholzen in Italien* (1883); *Frau Buchholz im Orient* (1888); *Frau Wilhelmine Buchholz' Memoiren* (1895), and *Hotel Buchholz Ausstellungs-erlebnisse* (1896). Stinde's contributions to dramatic literature include several comedies in the *plattdeutsch* dialect, which proved very popular at the Karl Schultze theatre in Hamburg, such as *Hamburger Leiden*; *Tante Lotte*; *Eine Hamburger Köchin*; *Die Familie Karstens*; *Die Blumenhändlerin von St. Pauli*; etc., also *Prinzess Tausende schön*, *Prinz Unart*, and *Ihre Familie* (written jointly with G. Engels). Stinde's Buchholz series are the favorite light reading of Prince Bismarck.

STING FISH. See WEEVER.

STING RAY, *Trygon*, a genus of cartilaginous fishes, of the order *raia* (see RAY) and family *trygonidae*. In this family the tail is long and slender, the eyes on the upper (dorsal) aspect, and in the genus *trygon* the tail is armed with a strong spine notched on both sides. The tail has either no fin, or a merely rudimental one. Only one species of sting ray occurs in the British seas (*T. pastinaca*), popularly known as the fire flaire. It is found in the Mediterranean, and thence to the northernmost parts of Europe. It resembles a skate in general appearance. The flesh is remarkable for its redness of color, and is not esteemed. The sting ray is dreaded from the power which it has of using its muscular and flexible tail as a weapon, twisting it round the object of attack, and inflicting severe lacerated wounds with the serrated spine. These wounds often cause great inflammation, whence a notion has been prevalent from ancient times that the sting is charged with venom; but of this there is no evidence. Other species of sting ray are plentiful in the warmer parts of the world, and they are everywhere dreaded. The spine is used by the savages of the South Sea islands to point their spears.

STINK-POT, in warfare a shell, often of earthenware, charged with combustibles, which, on bursting, emit a foul smell and a suffocating smoke. It is useful in sieges for driving the garrison from their defenses; also in boarding a ship, for effecting a diversion while the assailants gain the deck. The stink-pot is a favorite weapon of the Chinese. Under the more elegant title of Asphyxiated shell, the French and other modern nations have experimented considerably on this mode of harassing an enemy.

STINK-STONE, or SWINE-STONE, a kind of marble or limestone remarkable for the fetid urinous odor which it emits when rubbed. It contains a little sulphur.

STINK-TRAPS, a name given to certain very useful forms of drain-openings, which while allowing liquids to run down, prevent the escape of noxious gases. They are made of iron or earthenware, in a great variety of forms, but on one very simple principle, there being a curved or siphon pipe below the grating or grid which always retains sufficient water to prevent the outward passage of the gases.

STINK-WOOD, *Oreodaphne fatida*, a tree of the natural order *lauraceæ*, a native of the cape of Good Hope, remarkable for the strong disagreeable smell of its wood, which, however, is hard, very durable, takes an excellent polish, and resembles walnut. It has been used in ship-building.

STINT. See SANDPIPER.

STIPA. See FEATHER GRASS.

STIPE, in botany, a term used to designate the stem of palms and tree-ferns.

STIPEND, the provision for the support of the parochial clergy of the church of Scotland. It consists of payments in money or grain, or both, made out of the teinds or tithes of their parishes. The teinds, originally the tenths of the produce of the lands drawn in kind, have become converted into a separate estate, held under a liability for stipend. In a majority of cases they have been purchased at a valuation by the owners of the lands to which they belong, stipends having first been "modified" from them, and they are held under the burden of augmenting the minister's stipend to the extent of their value. Sometimes they have passed in to the hands of titulars, i.e., grantees from the crown and their successors, or belong to colleges and hospitals, to all of whom payment of tithes is made by the proprietor of the lands according to a valuation or composition; and the teinds formerly held by bishops or other dignified clergy are in the hands of the crown. In 1617 a commission was appointed by James VI. to modify stipends to the clergy from the parochial teinds. The provision was at first limited to a maximum of 10 chalders of victual or 1000 merks (£55 11s. 1d.) per annum and a minimum of 5 chalders or 500 merks (£27 15s. 6d.); but the minimum was raised in 1649 to 8 chalders, or 3 chalders and money for the other 5, at a conversion not ex-

ceeding £100 Scots or beneath 100 merks for each chaldar; and it has been the practice to allow a further sum to the minister to meet the expense of communion elements. The power of assigning, modifying, and localing stipends, has, since the union, been possessed by the judges of the court of sessions, sitting as a court of commission of teinds. When the existing stipend of a clergyman is considered insufficient, and there remains any free teind (i.e., teind as yet unappropriated for stipend), the court have it in their power to award him out of it what augmentation they deem suitable. But by act 48, Geo. III. c. 138. no stipend can be augmented a second time till after the lapse of 20 years from a previous augmentation. The augmented stipend is modified in vicual; but the minister receives it not in kind, but in value, according to the highest fiars (q.v.) prices of each year. By 50 Geo. III. c. 84, £10,000 annually was set apart from the revenue for the purpose of raising all stipends to £150, where the teinds of the parish did not provide that sum. Act 5 Geo. IV. c. 72 makes certain provisions out of the public revenue for those clergymen who have neither manse nor glebe, or who have a manse but no glebe, or a glebe but no manse, and whose stipends do not exceed £200 a year.

STIPULATION, in Roman law, was an agreement attended with certain solemnities. The word is used in English and Scotch law only in a popular sense, to denote any distinct matter expressly agreed upon by the parties to an agreement or deed.

STIPULE, in botany, a leafy appendage at the base of the leaf-stalk in many plants. Sometimes the stipule is solitary; but frequently there are two, one on each side of the leaf-stalk. They are of very various form and character, often very dissimilar to the leaf with which they are connected. In some plants, they are large, enveloping the young leaf, but soon falling off; in many, they are deciduous; but in many they are as permanent as the leaf itself. Their presence or absence, their deciduous or persistent character, and other peculiarities which they exhibit, form distinctive characteristics not only of species and genera, but of natural orders. They are generally green, like leaves; but sometimes membranaceous. In some plants, they assume the form of spines; in *cucurbitaceæ*, that of tendrils. Organs of the same nature with stipules appear at the base of the leaflets of some compound leaves.

STIRLING, a market, t. river-port, and royal, parliamentary, and municipal burg, capital of the county of the same name, stands on the s. bank of the Forth, 35 m. n.w. of Edinburgh by railroad. Like Edinburgh, to which city it bears, in its main features, a striking resemblance, it no doubt owes its origin to the strong natural fortress of its Castle Hill. From this hill, covering the declivity which slopes n. and eastward to the plain, extends the oldest part of the town, around which are numerous streets; while many villas have risen in the environs. The Castle Hill, which rises gradually from the e., and fronts the w. with a steep, precipitous wall of basaltic rock, overlooks the beautiful and fertile *carse*, or flat, which lies along the banks of the Forth. Among the more prominent public buildings and institutions are the East and West Churches—the former erected by James IV. about 1494, the latter built at a later period; and “Mar’s Work,” an incomplete structure, built by the earl of Mar, regent of Scotland, who died in 1572, when the building was in progress. This architectural fragment is richly ornamented. In the more ancient quarters, one or two pleasing specimens of old Scotch domestic architecture may still be seen. Of these “Argyle’s Lodging,” with its pinnacled round towers and decorated windows, is the chief. It is now used as a military hospital. The town-house is surmounted with a spire, and has the old jail attached. It contains the jug or standard of dry measure which was given to the keeping of Stirling by the Scottish parliament; while Linlithgow is said to have received the flint; Edinburgh, the ell, etc. The new jail is a handsome building. Cowan’s hospital, founded in 1639, is an object of interest. There are also an atheneum, corn exchange, and numerous excellent schools. A magnificent art institute, called the Smith institute, in honor of the founder, was opened in 1874. The importance of Stirling in early times was due to its situation and its defenses. At the head of the navigation of the Forth, when there were no regular ferries, Stirling was the key to the Highlands, and the possession of its strength and its means of communication between n. and s. was of the greatest importance. The town, besides, was strongly fortified by both nature and art. The ancient bridge of Stirling, the age of which is unknown, but which was in existence in 1571, is composed of four arches, and was defended at each end by gates and towers. This bridge was, until quite recent years, the only one by which wheeled carriages could cross the Forth. Vessels of 150 tons can reach the port of Stirling, but its commerce by river is now of less importance than before the days of railroads. Stirling is a central railroad station, and the means of communication in every direction are ready and abundant. The rich agricultural, mining and manufacturing districts around are to a great extent the basis of the prosperity of the town itself. Manufactures of ropes, malt, leather, soap, and mineral oils are carried on. The town unites with the Dunfermline burghs in sending a member to the house of commons. Pop. ‘81 of parl. burgh, 16,001.

Stirling (formerly *Stryvelyne*, or *Estrivelin*) is one of the most ancient and historically important towns of Scotland. It is of unknown antiquity; and there is no record from which the date of the foundation of even the castle can be determined. It must have been a frontier fortress from the earliest times. Alexander I. died in the castle in 1124. In the vicinity, the battle of Stirling was fought in 1297. See WALLACE. The town was taken by Edward I., after a siege of three months, in 1304. In the vicinity, at Ban-

nockburn (q.v.), the famous battle of that name was fought in 1314. The castle was the birthplace of James II. and of James V. James III. built the parliament house in the castle, and otherwise improved and embellished the fortress. James V. built the palace, the walls of which are profusely covered with grotesque ornamentation. In the older part of the castle is the "Douglas Room," in which William, earl of Douglas, was assassinated by James II. In 1651, after the battle of Dunbar, the castle was taken by Monk; and it withstood a siege by the Highlanders in 1745. The view from the towers of Stirling castle is unsurpassed in beauty. Westward, the rich vale of Menteith stretches away to the Highlands, where Ben Lomond, Ben Venue, Ben A'an, and Ben Ledi close the scene. The glittering "links" of Forth are seen in the carse of Stirling, surrounded by fertile fields and luxuriant woods; the Abbey Craig, crowned by the Wallace monument, rises boldly on the n.; while on the e. are seen the picturesque ruins of Cambuskenneth Abby.

STIRLING, EARL OF. See ALEXANDER, WILLIAM.

STIRLING, JAMES, mathematician, was born in Stirlingshire, Scotland, in 1692. He was educated at Glasgow and Oxford, and went to Venice as professor of mathematics. While here he published his *Lineæ Tertii Ordinis Newtonianæ, sive*. On account of his discovery of a trade secret of the glass-makers of Venice, he was obliged to leave Venice, and returned to London, where he was engaged in teaching for many years, and where in 1730, he published his most important work, *Methodus Differentialis, sive Tractatus de Summatione et Interpolatione Serierum Infinitarum*. He died in 1770.

STIRLING, JAMES HUTCHINSON, LL.D.; b. Glasgow, 1820; studied art and medicine at the Glasgow university. He practiced medicine for some years in South Wales, but in 1857 visited the continent, while there and after his return to England pursued an extensive course of philosophical study. He has published *The Secret of Hegel*, a translation of Schwegler's *History of Philosophy*; *As Regards Protoplasm*; *Lectures on the Philosophy of Law*; *Philosophy and Theology* (1890); *Workmen and Work* (1894), etc.

STIRLING, Sir THOMAS, 1735-1808; b. Scotland; commanded a company of royal highlanders, 1757. In 1758-59, he served under Abercrombie and Amherst; was present at the siege of Niagara, and joined in the expedition to Lower Canada, 1760. In 1766 he was on duty in Philadelphia, leaving his station at fort Chartres. He was made lieutenant, 1771, was prominent in all the great battles of the revolutionary war, and rose through successive grades to general, 1801. He was knighted in 1796.

STIRLING, Sir WILLIAM. See MAXWELL.

STIRLINGSHIRE, a county of Scotland, forming the border between the Highlands and Lowlands of the country, is bounded on the n. by Perthshire, and by the river and firth of Forth. Area, 467 sq. m.; pop. in '81, 112,443. A considerable part of Stirlingshire is occupied by the carse of Stirling and Falkirk, which were formerly covered for the most part with unproductive moss. On the removal of the moss-soil, part of which was floated off into the Forth by the agency of running water, a rich clay-soil, of various depths, from a plow-furrow to 20, and even 30 ft., was reached, and is now cultivated with the most marked success. The chief elevation is Ben-Lomond (q.v.), in the north-west. The chief rivers are the Forth (q.v.), the Carron—navigable for small vessels to Carron-shore—and the Endrick. Loch Lomond (q.v.) is the only important lake in the county. Stirlingshire is remarkable for its mineral stores, especially ironstone, which is wrought on an extensive scale at Carron (q.v). Woolen goods, etc., are largely manufactured, especially at Alva, Bannockburn, and in the neighborhood of Stirling (q.v.).

STIR RUPS (naval) are eyes of rope pendent from the yards, and supporting several portions of the tackle connected with the management of the sails.

STITCH in the side is the popular and expressive name applied to the pain felt in pleurisy. It occupies a point or small spot on a level with, or just beneath the breast on the left side; and patients state that they feel as if some sharp stabbing instrument were being driven in at that spot, whenever the act of inspiration goes beyond a certain limit. It is termed in French *Point de Côté*. See PLEURISY. A simple modification of stitch is by no means uncommon, if a person take exercise shortly after partaking of a full meal. The pain in this case is seated lower in the side, and is usually removed by stooping. Hence the popular remedy for this pain is to make a cross upon the foot.

STITCH'WORT, *Stellaria*, a genus of plants of the natural order *caryophylleæ*, having a calyx of 5 leaves, 5 deeply-cloven petals, 10 stamens, 3 styles, and a many-seeded capsule opening with six teeth. The species are numerous, and several are very common in Britain, annual and perennial plants, with weak stems and white flowers, which in some are minute, and in others are large enough to be very ornamental to woods and hedgebanks, as in the wood stitchwort (*S. nemorum*) and the greater stitchwort (*S. holosta*). To this genus the common chickweed (q.v.) is generally referred.

STITH, WILLIAM, 1689-1755, b. Va.; educated in England, and took orders in the church. He was appointed master of the grammar school of William and Mary college, Va., in 1731, was chaplain of the house of burgesses in 1738, and president of William and Mary college, and rector of Henrico parish from 1752 to his death. He wrote a

History of the First Discovery and Settlement of Virginia, 1747, in accuracy of detail not exceeded by any American historical work.

STIVER, a coin of Holland, equivalent to about two cents, being the $\frac{1}{20}$ of a guilder or gulden. See FLORIN.

STOAT. See ERMINE.

STOBE'US, JOANNES, an ancient Greek writer, native of Stobi, Macedonia. It is thought that he lived about 500 A.D., but almost nothing is known about his personal life. He made two extensive works of selections from several hundred Greek authors. These collections were called the *Eclogæ* and the *Anthologion*, and by them many utterances of ancient writers have been preserved to us, which would otherwise have been lost.

STOCK, or STOCK GILLYFLOWER, *Matthiola*, a genus of plants of the natural order *crucifere*, having cylindrical or compressed pods, and a stigma consisting of two upright appressed plates, the outer side of which often rises into a knob or horn. The species are herbaceous or half-shrubby, natives of the countries around the Mediterranean sea, most of them thickly clothed with white or grayish stellate hairs; the flowers in racemes, and generally beautiful and fragrant. Some of the species have long been much cultivated, and many fine varieties have been produced by cultivation. *M. incana*, a very rare and even doubtful native of England, is probably the parent of the greater number of the cultivated kinds with hoary leaves, known as Brompton stock, etc.; while those with smooth leaves, called ten-week stock, German stock, etc., are referred to *M. annua*, *M. glabra*, and *M. fenestralis*, which, perhaps, are mere varieties of one species. The sandy shores of Wales and of Cornwall produces a species, *M. sinuata*, the large purple flowers of which are fragrant only at night—a characteristic also of several other species. Stocks are always raised by gardeners from seed, which even the double kinds often produce, a multiplication of the petals having taken place without loss of the parts of fructification. Of the seedlings, however, some produce double and others single flowers, so that only some gratify the cultivator. The hoary-leaved stocks are generally treated as biennials, although, in reality, they may almost be reckoned perennial; and it is not desirable that they should flower in the first year, as the plants become stronger when they remain without flowering till the second year, and produce richer racemes of flowers. The smooth-leaved stocks are treated as annuals.—The beautiful little annual called Virginian stock does not belong to this genus, although it is of the same natural order. Its habit is indeed very different. It is *Malcolmia maritima*, and notwithstanding its popular name, is a native of the shores of the Mediterranean. It has become one of our most favorite flowers, almost rivaling mignonette, and is all the more esteemed because it grows well in the little garden plots which are exposed to the smoke of towns.

STOCKBRIDGE, a town in Berkshire co., Mass.; on the Housatonic river and the New York, New Haven, and Hartford railroad; 17 miles s. of Pittsfield. It was incorporated in 1739, and contains the villages of Stockbridge, Curtisville, and Glendale. There are a high school, public library, Williams academy, national bank, Goodrich memorial bridge, Jonathan Edwards monument, chimes tower, old Indian mission house, and several parks. It is a popular summer resort, with beautiful scenery, including the river, lake Averic, lake Mahkeenac, and Monument mountain. Pop. '90, 2132.

STOCKBRIDGE, HENRY, b. Mass., 1822; graduate of Amherst college, 1845; studied law and was admitted to practice in Maryland, 1848. He favored the union cause in the late civil war; member of the state legislature, 1864. He was a member of the constitutional convention which met to decide the question of the abolition of slavery in the state, was active in securing the adoption of the constitution framed by its members, and defended it before the courts. It was by his exertions that the indentures of apprenticeship which threatened to take the place of slavery were omitted from the statutes, and enfranchisement secured, without possibility of evasion, to the colored children of Maryland. He d. Mar. 11, 1895.

STOCK-BROKER, or SHARE-BROKER, a person employed in buying and selling stock in the public home and foreign funds, also in stock or shares of joint-stock companies. In most of the principal towns stock exchanges are established, and the stock or share brokers are members of such exchanges, and are bound to transact business in terms of the rules and regulations of the exchange to which they belong. In London, in addition to ordinary brokers, there are what are called sworn brokers, who require a license from the city corporation, for which certain fees are exacted, before being entitled to transact business in the public funds. In the provincial exchanges the brokers require no license, nor do they pay any fee to government or other authorities. The charge for brokerage or commissions varies from $\frac{1}{2}$ in consols to $\frac{1}{2}$ per cent in railway stocks; the rates for shares being charged according to the amount of the share, and in accordance with a scale adopted by the stock exchanges.

STOCKDOVE, *Columba anas*, a wild pigeon, native of Europe; a beautiful gray bird with a burnished metallic purple breast, scarlet eyes, orange-colored bill, and red legs. It is about 14 in. in length from bill to end of tail. It is named from its habit of making its nest in hollow stumps or tree stocks.

STOCK EXCHANGE, an organization of persons whose business it is to buy and sell stocks, bonds, and other securities, municipal, state, or national; or of corporations engaged in mining, transportation, banking, or commerce, in open market at specified times, and under strict rules. The New York stock exchange was first regularly organized in 1817, but its records were destroyed in the great fire of 1835. A similar organization existed in Philadelphia prior to that in New York, after which the latter was patterned. The stocks dealt in were U. S. stocks, state stocks, and city bank and insurance stock. By 1830 railroad stocks had come into the market—Mohawk, Catskill, Harlem, etc.; and the Morris and Delaware and Hudson canals. In 1823 the initiation fee of the New York stock exchange was \$25; in 1827, \$100; and in 1833, \$150. At present a seat in the board is worth \$25,000. The number of members is 1100; and in case of the death of a member, his seat is sold, and the sum received paid to his heirs—less any dues or unfulfilled contracts standing against his name. The regulations are very stringent, some of them involving for their breach expulsion and loss of seat without indemnity. A gratuity fund pays to the heirs of any broker who dies in good standing, the sum of \$10,000, without deductions. About 200,000 shares of stock change hands daily, and the operations sometimes cover \$50,000,000 value of securities handled. A committee on arbitration settles disputes among members. On the failure of a member of the stock exchange, his assets (stock, bonds, and other securities) are sold at public sale “under the rule,” and the proceeds divided among his creditors. The processes of sale in the exchange, though apparently complicated, and impossible for the uninitiated to understand, are in reality simple enough. A call of the list of stocks is made twice a day, as a matter of form; and the government, state, and railroad bonds are called in a room specially devoted to that purpose. But the sales are made by the brokers themselves, each one offering whatever stock he has to sell, crying it aloud, number of shares and price; or naming the price he offers for a stock, if buying. These cries, which issue from several hundred throats at the same time, are readily distinguished and understood by the brokers, and the transactions are closed and noted accurately. Persons employed for the purpose gather and record as many of these sales as possible, and these are sent by the telegraph instrument to all the different offices and places of resort where connecting instruments are kept, where speculators and investors can watch the market, and knowing the fluctuations and indications as they occur, can give their orders to their brokers intelligently. The record of transactions is abbreviated both as to the name of the stock and the nature of the sale. Thus, “L.S. 400:125:s.60,” means 400 shares of Lake Shore and Michigan Southern railroad stock at \$125, to be delivered at the seller's option any time within 60 days. The option is with the buyer if recorded “b.60;” the number of days of course varying according to agreement. The letters *ex.* mean less dividend. Applied to bonds, *c.* means coupon, and *r.* registered; *o.b.* stands for delivery at the opening of the books of transfer. Stock is bought either for its full value in cash, or on a *margin*. In the latter instance, the client deposits with his broker 10 per cent. of the par value of the stock, thus securing the latter against a loss, since he can sell if the stock falls to the point which the margin covers; or can call for more margin, selling if the client declines further risk. Those who contract to deliver stock at a future day at a fixed price are said to *sell short*, and are technically called “bears,” because they desire to squeeze or depress the market. “Bulls,” on the contrary, buy stock for a rise, and are called “long” of the stock, and “bulls” because their interest is to raise the market price. The broker's commission for buying or selling is $\frac{1}{4}$ of 1 per cent, except to members of the board, who pay \$2 per 100 shares. The business in “stock privileges,” as they are called, is a peculiar one, involving the technical terms “puts” and “calls.” A broker who sells a “put,” agrees to buy a specified stock in a certain number of shares, within a stated time, at a specified price, provided the seller be willing to deliver the stock at the price and time named. If the broker sells a “call,” he agrees to deliver a certain number of shares of a given stock on call within a stated time at a specified price. The cost of these privileges is arranged between the parties on the condition of the market, the time involved, etc. For the purpose of keeping up the gratuity fund for the heirs of deceased members of the exchange, every surviving member is assessed on occasion of a death in the sum of \$10. This system, which results in the payment of \$10,000 on the occasion of every death, was founded in 1873. If the net profits of the exchange exceed \$10,000, half the excess goes to the capital of the gratuity fund. The conduct of the business of the stock exchange is, as has already been remarked, under the strictest regulation, and the instances of dishonesty or impropriety have been, it is said, fewer in proportion to the number of persons engaged, and to the magnitude of the transactions involved, than in any other mercantile business. The stock exchange of New York is situated on Broad and New streets, and is a handsome building, containing probably the largest and strongest vaults for the reception of securities, in the world, and commodious rooms for the transaction of business. Visitors are admitted to a gallery set apart for the purpose.

STOCK-FISH, a commercial name of salted and dried cod and other fish of the same family, particularly the ling, hake, and torsk (see these heads). The fish is cured as soon as possible after being caught. It is split up from head to tail, cleansed from all particles of blood by plentiful washings with salt water; a piece of the back-bone is cut

away; and after the superfluous water has drained off, the fish are laid in long vats, covered with salt, and kept down by heavy weights. By and by they are taken out, washed and brushed, and then exposed to sun and air on a sandy beach or upon rocks. They are afterward gathered into little heaps, and when they assume a fine whitish appearance, known as the *bloom*, they are considered ready for the market. Great quantities of stock-fish are thus prepared in the northern parts of the world, and are not only used in the countries which produce them, but are largely exported to more southern regions, where they are in great demand. The cod, ling, and hake fishery of Scotland is next in importance to its herring-fishery. In 1873, according to the report of the Fishery commissioners, the yield was 160,716½ cwts. of dried fish, besides 12,381½ barrels cured in pickle. The quantity exported was 70,101½ cwts. cured dried. The quantity of stock-fish cured on the more southern coasts of Britain is inconsiderable.

STOCKHOLM, the capital of Sweden, is situated at the eastern extremity of the Maelar lake, in 59° 20' n. lat., and 18° 5' e. long. The pop. was, in '95, 271,638. Stockholm, which is one of the most beautiful capitals in Europe, is built partly on the continent, and partly on nine holms, or islands, lying in the channel through which the Maelar lake discharges its waters into the Baltic, about 36 m. distant. The Helgeandsholmen, Stadsholmen, and Riddarholmen, which formed the nucleus of the ancient city, founded in 1250 by Birgir Jarl, contain some of the finest public and private buildings, among which we may instance the royal palace, built in 1760, in the Italian renaissance style, and situated on a hill, commanding a view of the romantic shores of the lake. Near the palace, which possesses good antiquarian, numismatic, and other collections, a library, gallery of paintings, large gardens, etc., is the colossal statue of Gustavus III., on one of the fine quays which skirt the chief harbor of Stockholm; the cathedral, or St. Nicolaï's; the Knights' hall, with the adjoining market, ornamented with the fine statue of Gustavus Vasa, the council-house, the Riddarsholm kirke, where all the kings of Sweden since Charles X. have been buried, etc. Among the other public buildings, the most noteworthy are the observatory, the church of St. James, and the opera-house, with the neighboring and corresponding palace, in the aristocratic quarter of Norrmalm, which, with the new parade-ground, its public gardens, and its fine wide and even streets, ranks as the handsomest part of the town. The most picturesque of the nine islets of Stockholm is the Södermalm, on whose steep sides the houses, connected more frequently by steps than roads, rise in terraced rows to the even summit, which is crowned by St. Catherine's church. Numerous public gardens, summer palaces, and country-houses extend along the n.e. shores of the lake, and on the margins of Ladugårdslandet, now called Östermalm, the central portions of which present a picturesque blending of rocks, wooded heights, and romantic glens. On this side of Stockholm lies the famous Djurgård, or zoological gardens, one of the finest public parks in Europe, which occupies a peninsula two m. long, and one m. wide, whose natural beauties have been judiciously aided by art. The streets of the older quarters are narrow, crooked, and ill-paved; but in the better parts of the town there are fine straight streets and capacious squares and open places, with well-built stone houses; while in the suburbs the houses are mostly of wood. Stockholm is the seat of the government, and of the chief courts of law and administration, the residence of the sovereign, and the place of assembly for the legislative chambers. It is the center of the literary and social activity of the country, and has numerous scientific, artistic, educational, and benevolent institutions. In the immediate vicinity of Stockholm are the Karlsberg academy for naval and military cadets; and the Ulriksdal hospital, for invalided soldiers. No city has more picturesque environs, or more numerous public gardens and walks than Stockholm; while the many channels and canals connected with its large and commodious harbors facilitate traffic and intercommunication with the interior and with foreign ports. The docks have recently been greatly enlarged. Stockholm is the principal emporium of Swedish commerce; iron, timber, and deal planks are its main articles of export; but it is also the center of an active trade in the various manufactures of the place—as, for instance, leather, cotton, woolen, and silk fabrics, glass and porcelain, iron and steel goods, steam-engines, etc., which it sends, together with the ordinary colonial and other imports, to all the other towns of Sweden.

STOCKING-FRAME. The machine with which stockings, singlet drawers, and other similar garments are woven, was first invented by William Lee of Woodborough, Nottinghamshire. At first, it was a very simple affair, but has now become extremely complicated, although the simple principle upon which it was first originated is retained as the essential. This can only be understood by reference to the art of knitting, which originated it. In knitting, only one thread is used, and this formed into a succession of loops on a knitting-needle; each of these loops, then, has in succession another loop passed through it by means of another and similar needle, and this operation is carried on successively until the whole fabric is made. In the stocking-frame, instead of one needle to hold the stationary loops while those of the moving row are being inserted, there are as many needles as there are to be loops in the breadth of the web, and these are so made as to alternately form and give off the loops. Each needle terminates in a hook, a small indentation into which the bent point of the needle is easily pressed. The other end of the needle is fixed into a small casting of tin, formed to fit into a frame, and

be screwed tightly in, side by side with the rest of the needles. Between the needles are placed thin plates of lead or pewter, called *sinkers* in two rows; in one row, the sinkers move freely on an axis; in the other, they are all fixed to a bar, and move with it. The object of the loose ones, or *jack-sinkers*, is to make loops by pressing the thread down between the needles. The other row on the bar, or *lead-sinkers*, are brought down, so as to press simultaneously on the hooks of the needles, and press their points down into the little depression so that they will pass through the loops without catching one way, and take them up when opened and drawn in the contrary direction.

STOCKINGS. See **HOSIERY**.

STOCKMAR, CHRISTIAN FRIEDRICH, Baron, 1787-1863; b. Coburg; an army physician in 1814; in 1816 became physician to prince Leopold, who soon afterward made him his private secretary. In 1836 he brought about the marriage of prince Ferdinand of Coburg with queen Maria I. of Portugal, and in 1838 traveled with prince Albert to Italy. In 1858 he negotiated for the marriage of the present crown prince of Prussia with the English princess royal. See *Denkwürdigkeiten aus den Papieren des Freiherrn Christian Friedrich von Stockmar*, by Ernst von Stockmar (1872).

STOCKPORT, a t. of England, in the county of Chester, on the river Mersey, and 6½ m. s.e. of Manchester by railway. It is of great antiquity, but its prosperity is of modern date. Stockport has extensive manufactures of cottons, woolens, silks, machinery, brass and iron goods, shuttles, and brushes. Pop. '81, 59,544; '91, 70,253.

STOCKS, an apparatus of wood, much used in former times in England for the punishment of petty offenders. The culprit was placed on a bench, with his ankles fastened in holes under a movable board, and allowed to remain there for an hour or two. The period of their first introduction is uncertain, but in the second statute of laborers, 25 Edw. III. (1350), provision is made for applying the stocks to unruly artificers; and in 1376, the commons prayed Edward III. that stocks should be established in every village. Each parish had in later times its stocks, usually close to the churchyard, but sometimes in a more retired spot; and in some country places they are still to be seen, and not altogether disused. Combined with the stocks was often a whipping-post for the flagellation of vagrants. The use of stocks was general in the English North American colonies. In Massachusetts, a slanderer or profane person was first set in the stocks and then carried to the whipping-post. In the Southern states, slaves were sometimes set in the stocks as a punishment, as late as the present century.

STOCKS. See **DEBT, NATIONAL**; **STOCK-BROKER**; **STOCK EXCHANGE**.

STOCKTON, city and co. seat of San Joaquin co., Cal.; on Stockton channel, an estuary of the San Joaquin river, and on the Southern Pacific railroad; 45 m. s. of Sacramento. It was set off in 1849 by Charles M. Weber, the owner of a large Mexican grant, and was named in honor of Robert Field Stockton, of the U. S. navy, who took possession of California for the United States. In its early days it was the starting and outfitting point for miners bound for Calaveras, Tuolumne, and Mariposa cos. It is built on a plain in the great California valley; oak trees are scattered through its streets and surround its public buildings; and outside its limits are cultivable prairies extending for miles in all directions. It has an excellent harbor; the river here is navigable at all seasons by vessels of from 150 to 250 tons, and in the spring, above the city for 200 miles. It furnishes supplies to the farmers of the San Joaquin valley, receiving immense quantities of marketable produce, and is an important shipping point for wheat and wool. It contains the state insane asylum, a private sanitarium, the Hazelton public library, high school, public school library, national, state, and savings banks, electric light and street railroad plants, waterworks supplied chiefly from wells, St. Agnes's convent, St. Joseph's parochial school, and about a dozen churches. The city is the manufacturing center and the principal wheat market of the state. It has several large flour mills, grain warehouses, woolen mills, iron foundries, lumber and paper mills, machine shops, car works, agricultural implement works, and terra-cotta plant. There are daily, weekly, and monthly periodicals, several public squares filled with semi-tropical plants and flowers. The city has public school property valued at \$300,000, a total debt of less than \$325,000 and an assessed property valuation exceeding \$13,000,000. Pop. '90, 14,424.

STOCKTON, FRANCIS RICHARD, b. Philadelphia, 1834; was educated at the Central high school, Philadelphia; adopted literature as a profession, and became known first as a story-teller for young people, and then for both old and young; he became assist. ed. of *Scribner's Monthly* and *St. Nicholas*, but resigned, to work exclusively in preparing books. Besides a number of stories for children he has published: *Rudder Grange* (1879); *The Lady or the Tiger? and Other Stories* (1884); *The Casting Away of Mrs. Lecks and Mrs. Ale-shine*; *The Late Mrs. Null* (1886); *The Hundredth Man* (1887); *The Dusanter* (1888); *The House of Martha* (1891); *The Squirrel Inn*; *Fanciful Tales* (1894); *Adventures of Capt. Horn* (1895); *Mrs. Cliff's Yacht* (1896), and *The Great Stone of Sardis* (1897).

STOCKTON, RICHARD, 1730-81; b. N. J.; graduated at the college of New Jersey, then at Newark, 1748; admitted to the bar, 1754, where he soon became eminent; was in the executive council of New Jersey, 1768; judge of supreme court, 1774; in congress, 1776, where he cordially supported and signed the declaration of independence;

was on the committee to inspect the northern army and report its condition; after that service was taken prisoner by the British, confined in the common jail at New York, and treated with unusual severity, which exhausted his strength and cut short his life.

STOCKTON, ROBERT FIELD, 1795-1866; b. N. J.; became a midshipman while in college, 1810; was honorably mentioned in several actions, and made a lieutenant, 1814; distinguished himself in the war against Algiers; sent to the African coast, was influential in procuring the territory now known as the republic of Liberia, and captured several slave-ships; freed the West Indian seas from the pirates infesting them; engaged actively in politics, 1826-38; sent to the Mediterranean, 1838; made post-captain, 1839; gave plans for steam sloop of war *Princeton* which proved successful, marking an era in naval architecture; during the trial trip an unexplained explosion of the "big gun" wounded him and caused the death of the secretaries of war and the navy with three other distinguished men; commanded the Pacific squadron, 1845, and with a force of 1500 sailors and settlers, in 6 months conquered California and established a provisional government; resigned his commission, 1849, elected U.S. senator, 1851, and after promoting the abolition of flogging in the navy, resigned 1853. His *Life, Speeches, and Letters* was published 1856.

STOCKTON, THOMAS HEWLINGS, D.D., 1808-68; b. N. J.; studied medicine, became a Methodist Protestant minister; stationed at Baltimore, 1830; at Georgetown, 1833; chaplain to congress, 1833, holding the position for three successive sessions; chaplain to senate, 1862; resided in Philadelphia, 1838-47, and in Cincinnati, 1847-50; was pastor of St. John's Methodist Protestant church, Baltimore, 1850-55; pastor of the Independent church, Philadelphia, 1856-68. He published among others the following works: *Floating Flowers*; *The Bible Alliance*; *Stand up for Jesus, a Christian Ballad*; *Poems with Autobiographic and Other Notes*; *The Peerless Magnificence of the Word of God*. His vivid style and earnest pulpit delivery often drew great throngs.

STOCKTON-ON-TEES, a municipal borough and sea-port in the county of Durham, 11 m. e.n.e. of Darlington, on the left bank of the Tees. The broad and handsome High street is nearly a mile in length, and from it several minor streets diverge at right angles. A new t., known as South Stockton, has sprung up within the last few years on the right bank of the river, the two being connected by an iron bridge of three arches, built in 1887. The town contains two churches, a Roman Catholic chapel built by Pugin, several dissenting chapels, an athenæum, and other important edifices. The Stockton races, of some mark in the sporting world, are held here annually. Shipbuilding, chiefly in iron, is carried on to a great extent; and blast-furnaces, foundries, engine works, and extensive potteries and iron works are in operation. Sailcloth, ropes, linen, and diapers are manufactured; and there are breweries, corn mills, and spinning mills. The exports are chiefly iron manufactures, coal, coke, and agricultural produce; the imports are corn, timber in deals, spars, etc., and bark. The town is connected with the whole railway system of England and Scotland by the North-eastern railway company's branches, and there are two stations here. The Stockton and Darlington railway, the first in the united kingdom to commence passenger traffic, was opened for the double purpose of the conveyance of passengers and goods, Sept. 27, 1825. At Stockton the Tees is navigable for vessels of large tonnage; by a cut, by which a bend of the river is avoided, the town is brought 3 m. nearer the sea; the navigation of the river has been much improved, and great facilities for an extensive trade provided. Pop. of parl. borough, returning one member, '91, 68,895.

Stockton suffered severely from the incursions of the Scots in the early part of the 14th c., but even at that time it enjoyed considerable trade. It was taken for the parliament in 1644, and totally destroyed by the Roundheads in 1652. At the restoration it had become so poor a place that it contained only 120 houses, and most of these were built of clay.

STOCKWELL, STEPHEN N., 1823-81; b. Hardwick, Mass.; removed with his family to Worcester; at the age of 17 was apprenticed to the printer's trade. He passed a short time in St. John, New Brunswick, and with that exception lived continuously in Boston during a journalistic career of 40 years. He removed to Boston in 1842, entering the composing-room of the Boston *Journal*, became in time a reporter, afterward chief reporter. He was one of the corporators of the *Journal*, and his work was ceaseless in behalf of the interests of that paper, rising through intermediate positions to that of managing editor, and one of the proprietors, which position he resigned a few weeks previous to his death. He was a worker in Sunday-schools; and in his profession he was distinguished for strict business methods, and for his ability as an organizer, especially in the arrangement and condensation of daily news.

STODDARD, a co. in s.e. Missouri, having St. Francis river on the n.w.; intersected by the Missouri Southeastern and the St. Louis, Iron Mountain and Southern railroads; 840 sq.m.; pop. '90, 17,327, chiefly of American birth, with colored. It is drained by Castor river, lake Nicormy, 25 m. long and 4 m. wide, and small lakes and streams. The surface of the country was changed by an earthquake in 1811, and much of it is low and swampy. Forests of cypress grow near the lakes, and it has a good supply of building timber. The soil of the cultivable land produces good crops of grain, tobacco,

sorghum, and dairy products. Live stock find good pasturage. The manufactures are lumber and flour. Co. seat, Bloomfield.

STODDARD, AMOS, 1762-1813; b. Conn.; served in the revolutionary war, and at its close for some years practiced law in Maine, and was clerk of the Massachusetts supreme court. In 1798 he was made a capt. of artillery, and in 1804 was governor of the territory of Missouri. In the war of 1812 he was dangerously wounded at the siege of fort Meigs. He wrote *Sketches of Louisiana* (1810), and *The Political Crisis*, and a number of valuable historical papers.

STODDARD, DAVID TAPPAN, 1818-57; b. Mass.; graduated at Yale college, 1838; tutor in Marshall college, Penn.; declined a professorship at Marietta college, Ohio; studied theology at Andover; was tutor at Yale; licensed to preach by the Congregational association of Mass.; sailed as a missionary of the American board, 1843; had charge of the boys' seminary at Oroomiah, 1844; cholera prevailing and his health being impaired, he went to Erzeroom; visited the United States; returned to Persia, 1851. He prepared a *Grammar of Modern Syriac*; published in the *Journal of American Oriental Society*, 1855. *Observations of the Zodiacal Light* furnished sir John Herschel, and delivered a course of theological lectures in Syriac.

STODDARD, ELIZABETH (BARSTOW), b. Mass., 1823; married Richard Henry Stoddard in 1851, and has assisted him in editing several annuals. She has written three novels containing descriptions of life and scenery in New England; *The Morgesons* (1862); *Two Men* (1865); and *Temple House* (1867); also a juvenile, *Lolly Dink's Doings*.

STODDARD, RICHARD HENRY, born Mass., 1825; lost his father, who was a sea-captain, at an early age, and earned his living for several years in an iron-foundry in New York; printed privately in 1849 a volume of poems entitled *Footprints*, and a larger collection of *Poems* in 1852. He then received an appointment in the New York custom house, which he retained till 1870, devoting himself in the mean time to literary pursuits. He was city librarian in 1877, and he was from 1880 the literary critic of the *New York Evening Mail and Express*. He has published *Adventures in Fairy Land* (1853); *Songs of Summer* (1857); *Town and Country* and the *Voices in the Shells* (1857); *Life, Travels, and Books of A. von Humboldt* (1860); *The King's Bell*, a poem (1862); *The Story of Little Red Riding Hood*, in verse (1864); *The Children in the Wood*, in verse (1865); *Putnam the Brave* (1869); *The Book of the East* (1871); an edition of his *Poems* (1880); and *The Lion's Cub, and Other Poems* (1890). Stoddard has edited among other books, *Gen. Lyon's Political Essays, with his Life* (1861); *The Loves and Heroines of the Poets* (1861); *J. G. Vassar's Twenty-one Years round the World* (1862); *Melodies and Madrigals, mostly from old English Poets* (1865); *The Late English Poets* (1865); *Poets and Poetry of America* (1872); *Female Poets of America* (1874); the *Bric-a-Brac Series* (1874 et seq.), and *Under the Evening Lamp* (1892).

STODDARD, SOLOMON, 1643-1729; b. Boston; graduated at Harvard college, 1662; was fellow and librarian of the college, 1667-74; ordained minister of First church, Northampton, 1672. He was a learned man and an acute disputant. Believing the Lord's Supper to be a converting ordinance, he maintained that all baptized persons of correct moral life, though unconverted, might lawfully partake of it. He published in 1700 *The Doctrine of Instituted Churches* in reply to the work of Increase Mather entitled *The Order of the Gospel*; also *A Guide to Christ*; a treatise concerning *Conscience*; *The Trial of Assurance*. His views as to the Lord's Supper were quite different from those usual in Puritan churches, and did not gain permanence among them.

STODDERT, BENJAMIN, 1751-1813, b. Md.; served as capt. and maj. in the American revolutionary army, and distinguished himself at Brandywine. He was secretary of the navy, 1798-1801, and afterwards a successful merchant.

STOEVEER, MARTIN LUTHER, PH.D., LL.D., 1820-70; b. Penn.; graduated at university of Pennsylvania, 1838; tutor, principal of the primary department, and professor of Latin there, 1839-70. He published *Self-Culture*; *Life of H. M. Muhlenburg*; *Memorial of P. F. Mayer*; *Brief Sketch of the Lutheran Church in the U. S.*; edited *Literary Record*, 1847-48; *Evangelical Review*, 1857-70.

STOICS, the name for the sect of ancient moralists opposed to the Epicureans in their views of human life. The Stoical system dates from the end of the 4th c. B.C.; it was derived from the system of the Cynics, whose founder, Antisthenes, was a disciple of Socrates. Indeed, the doctrines, but still more the manner of life, and most of all the death, of Socrates, were the chief foundations of the Stoical philosophy.

The founder of the system was ZENO, from Cittium in Cyprus (he lived from 340-260 B.C.), who derived his first impulse from Crates the Cynic. He opened his school in a building or porch, called the *Stoa Pacile* ("painted porch") at Athens, whence the origin of the name of the sect. Zeno had for his disciple CLEANTHES, from Assos in the Troad (300-220 B.C.), whose *Hymn to Jupiter* is the only fragment of any length that has come down to us from the early Stoics, and is a remarkable production, setting forth the unity of God, his omnipotence, and his moral government. CHRYSIPPUS, from Soli in Cilicia (280-207 B.C.), followed Cleanthes, and, in his voluminous writings, both defended and modified the Stoical creed. These three represent the first period of the system. The second period (200-50 B.C.) embraces its general promulgation, and its introduction to the Romans. Chrysippus was succeeded by ZENO of Sidon, and DIOGENES of Babylon;

then followed ANTIPATER of Tarsus, who taught PANÆTIUS of Rhodes (died 112 B.C.), who, again, taught POSIDONIUS of Apamea, in Syria. (Two philosophers are mentioned from the native province of St. Paul, besides Chrysippus—Athenodorus, from Cana in Cilicia; and Archedemus, from Tarsus, the apostle's birthplace. It is remarked by sir A. Grant, that almost all the first Stoics were of Asiatic birth; and the system itself is undeniably more akin to the oriental mind than to the Greek.) Posidonius was acquainted with Marius and Pompey, and taught Cicero; but the moral treatise of Cicero, *De Officiis*, is derived from a work of Panætius. The third period of Stoicism is Roman. In this period we have Cato the younger, who invited to his house the philosopher Athenodorus; and, under the empire, the three Stoic philosophers whose writings have come down to us—SENECA (6 B.C.—65 A.D.), EPICTETUS (60–140 A.D.), who began life as a slave, and the emperor MARCUS AURELIUS ANTONINUS (121–180 A.D.). Stoicism prevailed widely in the Roman world, although not to the exclusion of Epicurean views.

The leading Stoical doctrines are given in certain phrases or expressions, as “life according to nature,” the ideal “wise man,” “apathy” or equanimity of mind, the power of the “will,” the worship of “duty,” the constant “advance” in virtue, etc. But perspicuity will be best gained by considering the *moral* system under four heads—the theology; the psychology or theory of mind; the theory of the good or human happiness; and the scheme of virtue or duty.

I. Their theological doctrines comprehended their system of the universe, and of man's position in it. They held that the universe is governed by one good and wise God, together with inferior or subordinate deities. God exercises a moral government; under it the good are happy, while misfortunes happen to the wicked. According to Epictetus, God is the father of men; Antonius exults in the beautiful arrangement of all things. They did not admit that the Deity intermeddled in the smaller minutiae; they allowed that omens and oracles might be accepted as signs of the foreordained arrangement of God. They held this foreordination even to the length of fatalism, and made the same replies as have been given in modern times, to the difficulty of reconciling it with free will, which in their system was unusually prominent. As to the existence of evil, they offered explanations such as the following: God is the author of all things except wickedness; the very nature of good supposes its contrast evil, and the two are inseparable, like light and dark, which may be called the argument from relativity; in the enormous extent of the universe, some things must be neglected; when evil happens to the good, it is not as a punishment, but as connected with a different dispensation; parts of the world may be presided over by evil demons; what we call evil may not be evil.

Like most other ancient schools, the Stoics held God to be corporeal like man; body is the only substance; nothing incorporeal could act on what is corporeal; the first cause of all, God or Zeus, is the primeval fire, emanating from which is the soul of man in the form of a warm ether.

It is for human beings to recognize the universe as governed by universal law, and not only to raise their minds to the comprehension of it, but to enter into the views of the Creator, who must regard all interests equally; we are to be, as it were, in league with him, to merge self in the universal order, to think only of that, and its welfare. As two is greater than one, the interests of the whole world are infinitely greater than the interests of any single being, and no one should be satisfied with a regard to anything less than the whole. By this elevation of view we are necessarily raised far above the consideration of the petty events befalling ourselves. The grand effort of human reason is thus to rise to the abstraction or totality of entire nature; “No ethical subject,” says Chrysippus, “could be rightly approached except from the preconsideration of entire nature, and the ordering of the whole.”

As to immortality, the Stoics precluded themselves, by holding the theory of the *absorption* of the individual soul at death into the divine essence; but, on the other hand, their doctrine of advance and aspiration is what has in all times been the main natural argument for the immortality of the soul. For the most part, they kept themselves undecided as to this great doctrine, giving it as an alternative, reasoning as to our conduct on either supposition, and submitting to the pleasure of God in this as in all other things.

In arguing for the existence of divine power and government, they employed what has been called the argument from design, which is as old as Socrates. Man is conscious that he is in himself an intellectual or spiritual power, from which, by analogy, he is led to believe that a greater power pervades the universe, as intellect pervades humanity.

II. Next, as to the constitution of the mind. We have bodies like animals, but reason or intelligence, like the gods. Animals have instinctive principles of action; man alone has a rational intelligent soul. According to Antoninus, we come into contact with Deity by our intellectual part, and our highest life is thus the divine life.

But the most important Stoical doctrine respecting the nature of man is the recognition of reason as a superior power or faculty that subordinates all the rest—the governing intelligence. (Very nearly the same phraseology is used by bishop Butler in setting forth the supremacy of conscience.) This, however, is not a mere intellectual principle, but an active force, uniting intellect and will. The bodily sensibilities are opposed to this higher reason and will, which, however, is strong enough to control them. Another way of expressing the same view was the power of the mind over the body, which was

dwelt upon by Epictetus in the most exaggerated form. The introduction of so glaring a mistake as that sickness may affect the body without enfeebling the mind could only end in practical failures, or else in contradiction.

In order to maintain their contrast with the Epicureans, the Stoics said that pleasure and pain are not principles of nature; by which they must have meant that humanity is not in fact, at least exclusively, governed by these, and that, in the regenerated man, they are not governing principles at all. Now, it is true, and a truth important for many practical purposes, that we are sometimes impelled to action without reference to our pleasures and pains; our habits often exemplify this state; it is still better shown in what are called "fixed ideas," as in involuntary imitation and sympathy. But these are exceptions; and any system that sets itself against the main fact that pleasure and pain are the great moving forces of mankind must somewhere or other contradict itself.

In Seneca we find something very closely approaching to the Christian doctrine of the corruption of human nature. The littleness of humanity was a favorite theme of Antoninus, and naturally followed from the Stoical mode of contemplating the universe at large.

The doctrine called the freedom of will may be said to have originated with the Stoics, although with them it was chiefly a rhetorical mode of expressing the dignity of the wise man, and his power of rising superior to circumstances.

To prepare the way for the Stoical precepts, Epictetus distinguished between things in our power and things not in our power. The things in our power are our opinions and notions about objects, and all our affections, desires, and aversions; the things not in our power are our bodies, wealth, honor, rank, authority, etc., and their opposites. The application is this: wealth and high rank may not be in our power, but we have the power to form an *idea* of these—namely, that they are unimportant, whence the want of them will not grieve us. A still more pointed application is to death, whose force is entirely in the idea.

III. We must consider next the Stoical theory of happiness, or rather of the good, which with them was not identified with happiness. They began by asserting that happiness is not necessary, and may be dispensed with, and that pain is no evil, which, however, if followed consistently, would dispense with all morality and all human endeavor. Substantially and practically, they held that pains are an evil, but, by a proper discipline, may be triumphed over. They disallowed the direct and ostensible pursuit of pleasure as an end (the point of view of Epicurus), but allured their followers partly by promising them the victory over pain, and partly by certain enjoyments of an elevated cast that grew out of their plan of life.

Pain of every kind, whether from the casualties of existence, or from the severity of the Stoical virtues, was to be met by a discipline of endurance, a hardening process, which, if persisted in, would succeed in reducing the mind to a state of apathy or indifference. A great many reflections were suggested in aid of this education. The influence of exercise and repetition in adapting the system to any new function, was illustrated by the Olympian combatants, and by the Lacedæmonian youth who endured scourging without complaint. Great stress was laid on the instability of pleasure, and the constant liability to accidents; whence we should always be anticipating and adapting ourselves to the worst that could happen, so as never to be in a state where anything could ruffle the mind. It was pointed out how much might still be made of the worst circumstances—poverty, banishment, public odium, sickness, old age—and every consideration was advanced that could "arm the obdurate breast with stubborn patience, as with triple steel."

It has often been remarked that such a discipline of endurance was peculiarly suited to the unsettled condition of the world at the time, when any man, besides the ordinary evils of life, might in a moment be sent into exile, or sold into slavery. Moreover, it is a discipline adapted to a certain class of dispositions existing in all ages—the men that prefer above all things "equanimity" of mind, and would rather dispense with great occasional pleasures than risk their state of habitual composure.

Next to the discipline of endurance, we must rank the complacent sentiment of pride, which the Stoic might justly feel in his conquest of himself, and in his lofty independence and superiority to the casualties of life. The pride of the Cynic, the Stoic's predecessor, was prominent and offensive, showing itself in scurrility and contempt toward everybody else; the Stoical pride was a refinement upon this, but was still a grateful sentiment of superiority, which helped to make up for the surrender of indulgencies. It was usual to bestow the most extravagant laudation on the "wise man," and every Stoic could take this home to the extent that he considered himself as approaching that great ideal.

The last and most elevated form of Stoical happiness was the satisfaction of contemplating the universe and God. Epictetus says that we can discern the providence that rules the world, if we possess two things—the power of seeing all that happens with respect to each thing, and a grateful disposition. The work of Antoninus is full of studies of nature in the devout spirit of "passing from nature to nature's God;" he is never weary of expressing his thorough contentment with the course of natural events, and his sense of the beauties and fitness of everything. Old age has its grace, and

death is the becoming termination. This high strain of exulting contemplation reconciled him to that complete submission to whatever might befall, which was the essential feature of the "life according to nature."

IV. The Stoical theory of virtue is implicated in their ideas of the good, now described.

The fountain of all virtue is manifestly the life according to nature, as being the life of subordination of self to more general interests—to family, country, mankind, the whole universe. If a man is prepared to consider himself absolutely nothing in comparison with the universal interest, and to regard it as the sole end of life, he has embraced an ideal of virtue of the loftiest order. Accordingly, the Stoics were the first to preach what is called "Cosmopolitanism;" for although, in their reference to the good of the whole, they confounded together sentiment, life, and inanimate objects—rocks, plants, etc., solicitude for which was misspent labor—yet they were thus enabled to reach the conception of the universal brotherhood of mankind, and could not but include in their regards the brute creation. They said: "There is no difference between Greeks and barbarians; the world is our city." Seneca urges kindness to slaves, for "are they not men like ourselves, breathing the same air, living and dying like ourselves?"

The Epicureans declined, as much as possible, interference in public affairs, but the Stoical philosophers all urged men to the duties of active citizenship. Although there had been many good and noble men among the pagans, yet positive beneficence had not been preached as a virtue before the Stoics. They adopted the four cardinal virtues (wisdom, or the knowledge of good and evil; justice; fortitude; temperance) as part of their plan of the virtuous life, the life according to nature. Justice, as the social virtue, was placed above all the rest. But most interesting to us are the indications of the idea of beneficence. Epictetus is earnest in his exhortations to forgiveness of injuries. Antoninus often enforces the same virtue, and suggests considerations in aid of the practice of it; he contends as strongly as Butler and Hume for the existence of a principle of pure, that is, unselfish, benevolence in the mind—in other words, that we are made to advance each other's happiness.

There is also in the Stoical system a recognition of duties to God, and of morality as based on piety. Not only are we all brethren, but also the "children of one Father."

The extraordinary stress put upon human nature by the full Stoic ideal of submerging self in the larger interests of being, led to various compromises. The rigid following out of the ideal issued in one of the paradoxes, namely, that all the actions of the wise man are equally perfect, and that, short of the standard of perfection, all faults and vices are equal; that, for example, the man that killed a cock without good reason was as guilty as he that killed his father. This has a meaning only when we draw a line between spirituality and morality, and treat the last as worthless in comparison of the first. The later Stoics, however, in their exhortations to special branches of duty, gave a positive value to practical virtue, irrespective of the ideal.

The idea of duty was of Stoical origin, fostered and developed by the Roman spirit and legislation. The early Stoics had two different words for the "suitable" (*kathēkon*) and the "right" (*katorthōma*); although it is a significant circumstance that the "suitable" is the lineal ancestor of our word "duty" (through the Latin *officium*).

It was a great point with the Stoic to be conscious of "advance," or improvement. By self-examination, he kept himself constantly acquainted with his moral state, and it was both his duty and his satisfaction to be approaching to the ideal of the perfect man. When renouncing the position of "wise," he yet claimed to be advancing. This idea, familiar to the modern world, was unknown to the ancients before the Stoics. It is very illustrative of the unguarded points and contradictions of Stoicism, that contentment and apathy were not to permit grief even for the loss of friends. Seneca, on one occasion, admits that he was betrayed by human weakness on this point. On strict Stoical principles, we ought to treat the afflictions and the death of others with the same frigid indifference as our own; for why should a man feel for a second person *more* than he ought to feel for himself, as a mere unit in the infinitude of the universe? This is the contradiction inseparable from any system that begins by abjuring happiness as the end of life. We may be allowed to regard our own happiness as of no importance, but if we apply the same measure to happiness in general, we are bereft of all motives to benevolence; and virtue, instead of being set on a loftier pinnacle, is left without any foundation.

The Stoical system has largely tintured modern ages, in spite of its severity. It has always had a charm as an ideal, even when men were conscious of not realizing it. It may be still considered as a grand experiment in the art of living, from which valuable lessons have resulted; just as a believer in alchemy, or in the perpetual motion, might make useful experimental discoveries. The limitation of wants, the practice of contentment, the striving after equanimity, the hardening of one's self against the blows of fortune, are all familiar to the moralist of later ages. A qualified form of the subordination of self to the general welfare, belongs to the modern theories of virtue.

The chief ancient authorities on the Stoics are the writings of Epictetus, Marcus Antoninus, and Seneca, themselves Stoical philosophers, together with notices occurring in Cicero, Plutarch, Sextus Empiricus, Diogenes Laërtius, and Stobæus. The completest

modern account of the system occurs in Zeller's *Philosophie der Griechen*, vol. iii. See also an article by sir Alexander Grant in the *Oxford Essays* for 1858; and *Stoicism*, by Capes, 1880.

STOKES, a co. in n. North Carolina, adjoining Virginia, drained by the Dan river, about 510 sq.m.; pop. '90, 17,199, inclu. colored. The surface is hilly and heavily timbered. The soil is fertile. The principal productions are corn, wheat, rye, and tobacco. Co. seat, Danbury.

STOKES, Sir GEORGE GABRIEL, one of the greatest living mathematicians and natural philosophers in Europe, was born, in 1819, at Skreen, co. Sligo, Ireland; educated at the school of Rev. R. H. Wall, D.D., Dublin; afterward at the Bristol college. He entered Pembroke college, Cambridge, in 1837; graduated in 1841, as senior wrangler, and first Smith's prizeman; became fellow of Pembroke in the same year; and was elected, in 1849, to fill, as one of the worthiest of Newton's successors, the Lucasian chair of mathematics in Cambridge. In 1885 he was appointed president of the Royal society.

He is best known, popularly, by his beautiful discovery of fluorescence (see PHOSPHORESCENCE). His paper *On the Change of the Refrangibility of Light*, is printed in the *Philosophical Transactions* for 1852-1853. His recent important physiological application of optical methods to the study of the oxidation of the blood, is noticed under SPECTRUM. But to mathematicians and natural philosophers, Stokes is known by a number of admirable papers in the *Cambridge Philosophical Transactions*, the *Cambridge and Dublin Mathematical Journal*, and the *Philosophical Magazine*. In them he has greatly extended and improved the mathematical treatment of questions connected with the distortion of elastic solids, the motion of waves in water, the undulatory theory of light, the summation of series, the internal friction of fluids, etc. Another excellent work by Stokes is his *Report on Double Refraction*, published in the British association reports for 1862. He was president of the British association in 1869. He has also published *Lectures on Solar Physics*, the *Burnet Lectures on Light* (1884), *Mathematical and Physical Papers* (1880-83), and *Gifford Lectures on Natural Theology* (1891-3). He was made a baronet in 1885.

STOKE-UPON-TRENT, a parliamentary borough and manufacturing t. of Staffordshire, 145 m. from London by the London and North-western railroad. It is the center of the "district" of Stoke, familiarly named the "Potteries," and is connected with Burslem and other places by steam tramways. The town of Stoke is regularly built, and contains many modern houses. The principal public buildings are the town-hall, New Market hall, and Minton Memorial building. There is also a statue to Josiah Wedgwood. Stoke owes its importance primarily to its porcelain and earthenware manufactures. The earthenware manufactures of the parish of Stoke are carried on in about 200 factories. In the vicinity are numerous coal-mines. Pop. of parl. borough, which sends one member to the house of commons, 1891, 75,352.

STOLBERG, CHRISTIAN, Count of, a German poet, b. at Hamburg, Oct. 15, 1748. He belonged to one of the oldest German families, originally of Thuringia, and which is mentioned in authentic documents of the 11th century. Stolberg studied at Göttingen from 1769 to 1774, where he was one of a distinguished literary circle in n. Germany, embracing Boje, Bürger, Miller, Voss, Hölty, and Leisewitz. In 1777 he married Louise, countess of Reventlow, whom he had previously celebrated in his verses; and after 1800, lived apart from public life on his estate of Windeby, near Eckernförde in Slesvig, where he died Jan. 18, 1821. As a poet, he was inferior in genius to his younger brother, but his pictures of family life are very fine. His principal works are *Gedichte* (Leip. 1779); *Gedichte aus dem Griechischen* (Hamb. 1782); *Schauspiele mit Chören* (Leip. 1787); and *Vaterländische Gedichte* (along with his brother; Hamb. 1815).

STOLBERG, FRIEDRICH-LEOPOLD, Count of, younger brother of the preceding, was b. at Bramstedt, Nov. 7, 1750, studied at Halle and Göttingen, and after a visit to Switzerland and Italy, in the course of which he made the acquaintance of Goethe at Frankfurt, and of Lavater at Zürich, he became in 1777 minister-plenipotentiary of the episcopal prince of Lübeck at the court of Denmark. Stolberg filled various other official situations in the course of his public life; but becoming a convert to Roman Catholicism, he resigned all his employments, and henceforth lived mainly in the society of his co-religionists. The causes that led him to take a step which lost him many old and dear friends, were partly the theological strifes between the Rationalists and orthodox Lutherans in Holstein—the country where he mostly resided, and partly his study of the controversial works of the Catholic writers during a second visit to Italy in 1790-91. He died at Sondermühlen, near Osnabrück, Dec. 5, 1819. Stolberg is a superior poet to his elder brother. There is greater boldness in his ideas and imagery, and he displayed a wonderful facility in versification. We have from him specimens of all sorts of poetry, songs, odes, elegies, metrical romances, satires, descriptive verse, and dramas, which are contained in the *Werke der Brüder Stolberg* (22 vols., Hamb. 1820-25). See *Friedr.-Leopold, Graf zu Stolberg*, by Nicolovius (Mainz, 1846). A very good account of Stolberg's change of faith, and of that literary circle of n. Germany in which he moved until his conversion, will be found in a book called *Entiner Skizzen* (Sketches of Entin), by Wilhelm von Bippin (Weimar, 1862).

STOLE (Gr. *stolé*, Lat. *stōla*, a robe) is the name of one of the sacred vestments used in the Latin church, and with some modification, in the Greek church also. It originated in a wide and flowing robe of linen, called also *orarium*, which hung from the shoulder, and which had a narrow embroidered border of a different color, as we learn

from St. Ambrose's sermon on the death of Satyrus (n. 43), and from Jerome's letter to Nepotianus (Ep. 52). The present stole seems to be the traditional representative of the embroidered border of the orarium in the Roman Catholic church, and consists of a narrow band of silk or precious stuff, edged and fringed with gold or embroidery. It is worn over the shoulders by priests and deacons, but in a different fashion—the former wearing it over both shoulders, with the ends hanging in front, or crossed upon the breast; the latter carrying it only from the left shoulder to the right side, where the pendent ends are fastened. In the eastern church the stole is worn pendent, over both shoulders by priests, over the left shoulder only by deacons. The stole is worn at mass, and in the administration of sacraments, in certain blessings, and in more solemn forms of preaching. It is also used, in some cases, as a symbol of jurisdiction, in which sense it is constantly worn by the pope, even when not officiating; and there is a very remarkable usage in Italy and other Catholic countries, illustrative of the same principle as to jurisdiction, of the parish priest, after he has administered extreme unction to a sick person, *leaving the stole upon the foot of the bed, not to be withdrawn until the death or recovery of the invalid.* Like the other sacerdotal vestments, the stole must be blessed by a bishop, or a priest delegated by a bishop. In the English church the stole is now generally used by the clergy, and is worn with the same difference by priests and deacons. In the case of dignitaries, doctors, and chaplains of noblemen or bishops, it is worn in the form of a scarf. The use of the stole in the English church appears to rest only upon ancient custom, as it is not specified in any rubric or canon. It is usually of black silk, fringed at the ends, with sometimes crosses embroidered.

STOLEN GOODS, in point of law, stand in this situation in England: a *bonâ fide* purchaser of such goods, who has not bought them in market overt, is bound to restore them to the true owner; but if the goods are sold in market overt, the purchaser is entitled to keep them, unless the owner has duly prosecuted and convicted the thief. Market overt means the open market in towns and places where a legal market is held, and the old doctrine was, that as all sales were conducted by exposure of goods in an open place, the owner of the lost goods was likely to find them easily by going to the nearest market—a doctrine which is now quite inapplicable to modern habits. In the city of London, every shop is held to be a market overt within the above rule, but this only applies to the city proper, and not the suburbs and western parts of the metropolis. The above rule, as to stolen goods, does not apply to valuable securities which are stolen, if the security has been paid or discharged *bonâ fide* by the person liable, or if the security is a negotiable instrument, and it have been *bonâ fide* transferred or delivered for a just and valuable consideration, without any notice, and without any reasonable cause to suspect that the same had been obtained by felony or misdemeanor. The law is obviously harsh as regards owners, for a man who has had the misfortune to have his goods stolen, must go to the further loss and expense of prosecuting the thief before he can recover them. There are no markets overt in the U. S. Any person buying stolen goods gets no better title to them than the thief had, i.e., the original owner may take them anywhere that he may find them. The rule is subject to the qualification that money or negotiable instruments, as coupon bonds, checks to bearer, bank bills, etc., which are intended to pass from hand to hand in the ordinary transactions of business may become the property of a purchaser from the thief in good faith. The reason of this distinction is obvious. Were the rule otherwise there would be an incalculable and undiscoverable risk attending every business transaction, so that commercial relations would be hampered and harmed.

STOLP, a garrisoned t. of Prussia, chief town of a circle in the province of Pommern, is situated on the river Stolpe, 12 m. from its mouth, and 75 m. w. of Danzig. Stolp, which is composed of an old and new town, with four suburbs, has a castle, 4 churches (one of which, the *Marienkirche*, dates from the 14th century), a hospital for invalids, amber and other manufactures, and an active general trade. Pop. '95 (with garrison), 24,845.—At the mouth of the river, lies Stolpmünde (pop. '95, about 2000).

STOMACH. The anatomy and physiology of the human stomach is fully treated in the article **DIGESTION**. This organ, the most important for the preparation of the nutriment of the body, varies greatly in different animals. Some of the protozoa, as infusoria, may be said to be all stomach, as they are, some of them, nothing but contractile sacs for the reception of alimentary matter which is contained in the water they inhabit. Another view may be taken, which is that these very low animals have no stomachs, and that all the digestion they perform is a tissue assimilation of organic and mineral matter. They are, however, generally spoken of as having stomachs. In the cœlenterata there is considerable diversity in the structure and relations of the stomach to the other parts, and yet a remarkable unity of plan, which is held by some to be evidence of progressive development; but the existence of a plan having perfect analogies may not be regarded as more than the evidence of order; and this is as consistent with the belief that an organism commenced its zoological life in much the same condition in which we find it, as with the hypothesis that it has been the subject of a constant change of type. In the hydrozoa the stomach cavity and body cavity are one. In actinozoa, that which answers to the stomach is a wide tube which empties into the body cavity; but the body cavity acts as a stomach also; and in fact what is usually regarded as a stomach is probably no more than an œsophagus or gullet. There is

a tendency in actinozoa to the formation of special organs, which means that there is more specialization of organs. In the *echinodermata*, the sub-kingdom which includes the sea-urchins, star-fishes, etc., there is a higher organization generally, as is seen in the radiate nervous system, and in these animals we find a stomach and an intestinal canal having no communication with the body cavity. In the star-fishes the stomach occupies the whole central part of the body. From it two long, tapering, ramified cæca are given, off opposite the commencement of each ray, and are distributed through it in a central line, so that there are ten pairs of cæcal appendages. In addition to these the stomach is provided with small, short cæca between the large trunks in the rays. In the sub-kingdom annulosa the form of the digestive apparatus exhibits much variety. In some orders, as *tanaida*, comprising the tape-worms, there is no stomach, nor even mouth proper. In the order *trematoda* there is a mouth and an alimentary canal, and consequently an arrangement which answers for a stomach, but there is only one aperture for the entrance of food and expulsion of fæces. In the second division of annulosa, viz., in *nematelmia*, there are in the first order *acanthocephala*, internal parasites without mouth or alimentary canal, but with proboscis and suctorial apparatus. In the next order *gordiacea*, comprising animals which during a portion of their existence are parasitic insects, there is sometimes an imperfectly developed digestive apparatus, or none. In the next order, *nematoda*, including the lumbricoid worms which infest the alimentary canal of mammals, there are well-developed digestive organs suspended freely in a body cavity, and provided with a mouth and excretory orifice. In the sub-class rotifera (wheel animalcules) there is a complex organization with a ganglionic nervous system. The stomach is large and well developed, but there are no organs of blood circulation or of respiration, although there is a corpusculated fluid in the body cavity. Among the annelides the common leech has an extensive digestive apparatus, the stomach not only being large and running nearly the whole length of the body, but provided with eleven capacious cæca.

In the crustaceans, particularly the lobster, the digestive organs are elaborate. The apparatus for mastication is efficient, and the mouth opens by a very short narrow gullet into a capacious stomach in which there are a great number of very minute teeth, and in addition three very large calcareous teeth situated near the pyloric orifice. A number of strong, calcareous bones, longitudinal in direction, support the membranous portion of the stomach, and form a basis for the support of the large teeth. The entire organ is covered externally with a layer of muscles of great power. Two of the large teeth resemble the molars of an elephant, and they have a sort of rotary molar motion. Between them is the third large tooth, which has a rounded surface, and assists in mastication by constantly pushing the food between the molars. The whole of this apparatus is called "the lady in the lobster." Some insects have even more elaborate stomachs than crustaceans. The locust has a marvelous masticating and digesting organism. See LOCUST and GRASSHOPPER, under sub-title *General Anatomy*. They seem to be furnished with all possible accessories for the trituration and solution of the coarse food upon which they live. The coleoptera are, as an order, perhaps possessed of more powerful digestive apparatus than the orthoptera, some of the beetles almost equaling the acrididae. They have a crop, a gizzard, and a chylic stomach, and are enormous eaters, as every housekeeper knows who has had experience with croton bugs and cockroaches, and every farmer who has defended his potato crop against the ravages of the Colorado beetle. (See POTATO BUG.) The crop and stomach of the honey-bee is a marvelous piece of mechanism. The œsophagus dilates into a large crop, the honey-collecting bag, which is capable of being dilated by muscular action so as to exhaust the nectar from flowers. The true stomach is connected with the crop in a remarkable manner. It commences by a small tube, which can be inserted into the crop or withdrawn from it. When inserted it is doubled upon itself, forming a shut valve through which the honey cannot pass. The bee feeds itself at will by withdrawing the tubular portion of the true stomach, when the contents of the crop are permitted to pass into it. In the mollusca the stomach and alimentary canal are often simple in structure, but efficient; for digestive fluids are furnished in great abundance. The rapid growth of the oyster is evidence of its power of digestion and assimilation. In some of the gasteropod mollusks the stomach is more complex, being often provided with cartilaginous or calcareous plates for the trituration of food. Distinct salivary glands are usually present, and the liver is well developed. The cephalopod mollusks, as the cuttle fishes and octopus, have enormously efficient digestive apparatus. See CEPHALOPODA.

In fishes the stomach is usually long and tapering, but the whole alimentary canal is frequently shorter than the fish. Their food is chiefly animal, and easy of digestion. In the batrachians we first meet with a structure of the mucous coat of the stomach bearing a resemblance to that of mammals. The stomach of the toad has gastric follicles which secrete a gastric fluid having properties like that secreted by the stomachs of higher animals, and the intestines present a beautiful arrangement of the capillary blood vessels. The ophidian reptiles have large and distensible stomachs for the reception of their prey, but their digestion is sluggish. In the chelonians there is a great advance. The gastric cells are large, and are freely traversed by capillary blood-vessels. In birds there is considerable variety in the form and extent of the stomach and alimentary canal,

depending upon their habits. See BIRDS. In mammals there is more variety than in birds, as their structure and habits are more variable. Carnivorous animals require a much less complicated digesting apparatus than omnivorous or herbivorous. See RUMINANTIA. The great ant-eater has, however, an apparatus in many respects resembling that of a common fowl, while the blood-sucking bat (*desmodus*) has a stomach whose capacity has more relations to its office of receiver than of digester, the pyloric end, where digestion is performed in this case, being very small, but sufficient for the disposal of the easily digested food. The cardiac portion is enormously elongated above the entrance of œsophagus, forming an elongated cæcum in contact at its further end with the spleen. There is considerable variety in the digestive apparatus of the quadrumana. The *semnopithecus entellus*, or sacred monkey of India, has an enormous stomach. A full-grown female of this species, examined by Prof. Owen, had a stomach which, when distended and dried, measured 2 ft. 7 in. along the greater curvature, and 1 ft. along the lesser. Its greatest circumference was 1 ft., and its least, about 2 in. above the pyloric orifice, was $3\frac{3}{4}$ in. Prof. Owen says that it may be regarded as consisting of three divisions: a cardiac pouch, a middle, sacculated portion, and a narrow, elongated canal, sacculated at its commencement and simple near its termination, which portion he considers to be the digesting portion of the organ. In the genus *cercopithecus*, which was formerly ranked with *semnopithecus*, the stomach has the usual simple construction, resembling that of most quadrumana and of man. It is generally thought that this enlarged stomach is not because of the vegetable-eating habits of the entellus, but as an offset to its want of cheek pouches, which other monkeys have, for the purpose of temporarily stowing away food.

STOMACH, DISEASES OF. In the discussion of the diseases of any organ, it is customary to begin with the consideration of its inflammation. In the stomach, however, acute *gastritis*, or inflammation of the mucous membrane of that organ, is so rare a disease, except as a result of the administration of an irritant poison, that it might almost pass unnoticed. Thus Louis states that during six years' experience at La Charité (one of the leading Parisian hospitals), in which he made notes of 6,000 cases of disease, and 500 dissections, he did not meet with a single case of fatal idiopathic (or spontaneous) gastritis. The simple fact, however, that this disease is almost always the result of poison, gives it a special interest, and renders it especially necessary that the physician should be so thoroughly acquainted with its symptoms, as to be able with certainty to detect it, and thus to be led to investigate its cause.

The symptoms which indicate that an irritant poison has been received into the stomach, are a gradually increasing sensation of uneasiness or heat, which shortly assumes an acute burning character in the epigastric region. This pain is accompanied with vomiting, which becomes increasingly frequent as the pain augments, and often with hiccup. There is usually extreme tenderness on pressure, and the patient bends his body forward to relax the muscular tension. During the accession of these symptoms, there is a marked degree of excitement, as indicated by the acceleration of the pulse and breathing, and the heat of the skin. This condition is, however, soon exchanged for one of prostration. The skin becomes cold and clammy, the pulse thready and feeble, and the breathing catching and intermittent; until finally, after a variable period of exhaustion, the patient sinks, usually retaining his mental faculties to the last. Although the above-described symptoms are always more or less present, each irritant poison occasions some special symptom, and some characteristic lesion; and the period at which death ensues varies for different poisons. Hence, quite apart from the results of analysis, a fair conjecture can usually be made as to the individual poison which has been administered.

Sub-acute gastritis is by no means a rare affection, and its occurs in two distinct forms—"one in which the malady is caused by a constitutional state, the effects of which are shown in a variety of other organs, as well as in the stomach; another in which it is due to causes connected chiefly or exclusively with this organ, which is submitted to an irritative process somewhat analogous to that typified by the gastritis of irritant poisoning."—Brinton, *On Diseases of the Stomach*, 1859, p. 101. The first of these forms is well illustrated in certain cases of scarlatina, in which, if death takes place between the third and seventh day of the disease, distinct marks of inflammation are seen in the stomach. The other variety, which is often of a chronic form, is best seen in cases of delirium tremens; the affection being sub-acute or chronic, according as it has been produced by a single prolonged debauch, or by a protracted habit of drinking spirits; the patient's final malady being induced by a deficiency of food, or the want of the ordinary stimulant. Purely chronic inflammation may be induced by various causes, of which the most common are the abuse of alcoholic drinks, habitual excess in eating, the eating of indigestible food, and the excessive use of irritating medicines.

The treatment of gastritis varies so much with each individual case, that we shall only lay down a few general principles. The first point is the removal of the cause; to be attempted in cases of irritant poisoning, either by the removal of the poison (by the stomach-pump or emetics, as, for example, sulphate of zinc), or by its neutralization by means of an antidote. In very severe cases, leeches may be applied to the epigastrium; but counter-irritants, such as turpentine on a hot moist flannel, or mustard-poultices, are

generally of more service. Continuous fomentation with water, as hot as can be borne, often gives great relief; while at the same time iced water, or small lumps of ice swallowed whole, usually relieve the thirst and mitigate the pain. Enemata of purgative materials, if the bowels are constipated, or of a soothing character (as thirty drops of laudanum in a little starch or gruel), if the bowels are irritable, may be prescribed with advantage. When the stomach begins to be able to retain food, it must be given in the form of a bland liquid, in small doses, at distant intervals. Chronic gastritis must be treated in much the same manner as indigestion (q.v.) The most essential point of treatment is the due regulation of the diet.

Ulcer of the stomach is the most important of the idiopathic diseases of that organ, both from its frequency, from the facility with which it may be detected during life, from the fact that at any period of its protracted course it may prove suddenly fatal, and from its being usually curable. The first and most characteristic symptom of this disease is pain, which commences as a mere dull feeling of weight or tightness, then gradually augments into a burning sensation, and at last assumes a gnawing character, and occasions a kind of sickening depression. This pain comes on in from two to ten minutes after the ingestion of food, and lasts for an hour or two; vomiting often ensues, after which the pain ceases. The place of its most common appearance and greatest intensity is the center of the epigastric region, or slightly below the free end of the ensiform cartilage of the sternum; and the painful spot is usually of a circular form, with a diameter varying from one to two inches. The pain in this region is succeeded, in the course of a few weeks, by a gnawing pain in the back, ranging in position from the eighth dorsal to the second lumbar vertebra, and most commonly lying between the two shoulder-blades. The pain in both the epigastric and the dorsal region is almost always much increased by pressure; it is also specially affected by certain kinds of food and drink, being increased by the ingestion of hard and indigestible substances, and lessened by a bland and pulpy diet. As a general rule, the pain is aggravated by tea, beer, and hot food; although exceptions occasionally occur. The next symptom in this disease is vomiting or regurgitation, expelling the food previously taken, or a glairy alkaline fluid. The vomiting usually occurs when the pain is most intense, and is a dangerous symptom, since it tends to starve the patient, and to increase the fatigue of an already weakened frame. At this stage the disease is sometimes terminated by the occurrence of perforation, ending in rapidly fatal peritonitis; and if this accident does not occur, the dyspeptic symptoms become complicated by hemorrhage from the stomach, sometimes so rapid that it distends the stomach and adjacent small intestine with a single gush, and causes fainting and almost immediate death; but more commonly occurring as a slow and intermittent drain of blood, giving rise to anemia. If death from the above causes (inanition, perforation, or hemorrhage) does not terminate the disease, the symptoms frequently subside in something like the inverse order in which they occurred, and recovery, often after many years' suffering, ensues. With regard to frequency of ulcer of the stomach, Dr. Brinton, who has carefully studied this disease, states that this lesion may be detected in (on an average) 5 per cent. of persons dying from all causes; that it occurs twice as frequently in females as in males, and that it is specially a disease of middle and advancing life—27 being the average age in females, and 42 in males. Nothing is known with certainty regarding the causes of this disease, except that advancing age, privation, mental anxiety, and intemperance so frequently coincide with it, that they may be regarded in some degree as producing it. In relation to treatment, strict attention to diet is of the first importance. When the symptoms are urgent, the patient should maintain the recumbent position, and should be fed on lukewarm milk, thickened with biscuit-powder, given in doses of one, or, at most, two table-spoonfuls every two hours. The pain is often relieved by the application of a mustard-poultice to the painful spot; and benefit is frequently derived from the internal administration of bismuth (in doses of ten grains), either given alone or combined with the compound kino powder (in five-grain doses). When there is hemorrhage small lumps of ice may be swallowed; and if all food is rejected by vomiting, beef-tea injections must be thrown into the lower bowel. Aperients are sometimes required, but they must be given with caution; and if castor-oil can be taken without increasing the pain or vomiting, it is the most harmless remedy of its class.

Cancer of the stomach is a disease of much interest, from its being obscure in its symptoms and difficult of detection in its early stage, frequent in its occurrence, and always fatal in its termination. The typical course of this disease is graphically sketched by Dr. Brinton in the following paragraph: "An elderly person perhaps hitherto free from dyspepsia, begins to suffer from a capricious, and soon a diminished appetite; which is by and by associated with occasional nausea, or even vomiting, and with a sense of uneasiness or distention of the stomach. His complexion, already pale and unwhole some, next acquires a muddy, yellowish, or faint greenish hue. His gastric symptoms now increase; often by a sudden and marked augmentation, which corresponds to what is in other cases their first appearance. Vomiting, if already present, becomes more frequent and urgent; local uneasiness deepens into pain; and both these symptoms are excited or increased by taking food. At a somewhat later period hemorrhage generally occurs, usually but scanty in amount, and therefore depending to a great extent on casual circumstances for its detection. About this time, a tumor often becomes perceptible

tible near the middle of the epigastric region of the belly. As the local symptoms increase, the cachexia of the patient also augments; and is evidenced not only by the color already mentioned, but also by debility and emaciation; and at last by prostration, which ends in anasarca, delirium, and death."—*Op cit.*, p. 225. From the records of 600 cases, Dr. Brinton finds that most deaths occur between the ages of 50 and 60 years. The form of cancer which most frequently attacks the stomach is the scirrhus or hard cancer. Out of 180 cases, scirrhus occurred in 130 (or nearly three-fourths of the whole), medullary or encephaloid cancer in 32, colloid in 17, melanotic deposit in 3, and villous cancer in 1. In the treatment of this formidable disease, more good is done by careful attention to the diet than by any medicine. Good milk or strong beef-tea thickened with biscuit-powder may be given in the same manner as recommended in ulcer; and milk mixed with a little old Jamaica rum will sometimes stay on the stomach when everything else is vomited. If there be pain, opiates must be given, and they may be prescribed either in the ordinary way, or as enemata, the latter having the advantage of not inducing constipation.

Hæmatemesis, or vomiting of blood, must be looked upon rather as a symptom than a disease. Thus, it may occur by the ulcerative destruction of the walls of a comparatively large blood-vessel, as in gastric ulcer and in cancer; but it generally is of the kind termed capillary. The latter kind of hemorrhage happens under various circumstances, of which the following are the principal: 1. The bleeding may be idiopathic, or unaccompanied by any structural change. This variety is extremely rare. 2. It may take the place of some habitual hemorrhage, or, in other words, be vicarious. Thus it frequently takes the place of the menstrual discharge. 3. It is often a consequence of disease or injury of the stomach; for example, it frequently occurs after the ingestion of strongly irritant poisons, or even an immoderate dose of alcohol into the stomach. 4. It may be a consequence of disease in adjacent viscera, occasioning an overloading of the veins of the stomach; thus it is frequently caused by enlargement of the spleen, and occurs in those states of the liver in which there is obstruction of the portal circulation; and under this category we must place the gastric hemorrhage which not unfrequently occurs in the advanced periods of pregnancy, in consequence of the pressure exerted by the enlarged uterus on the venous circulation of the abdomen. 5. It may result from changes in the composition of the blood, such as occur in scurvy, purpura, and yellow fever. The treatment must be directed against the disease on which the hemorrhage depends, rather than against the mere symptom; but from whatever cause it arises, if it is proceeding to a dangerous extent, the patient should be kept perfectly quiet in bed, and should swallow small pieces of ice. Hot applications may also be applied to the extremities, with the view of directing the blood to those parts. The medicines most likely to be of service are acetate of lead, gallic acid, dilute sulphuric acid, and oil of turpentine; but they should only be given on medical authority.

Some of the other affections of the stomach are discussed in special articles. See CARDIALGIA, INDIGESTION, SARCINA, etc.

STOMACH-PUMP, an instrument used to remove poisons from the stomach, to feed persons who attempt to starve themselves, etc. It is a syringe with a flexible tube, inserted into the stomach through the œsophagus, and by which fluid is injected or removed.

STOMAPODA (Gr. mouth-footed), an order of malacostracous crustaceans, to which *squillidae*, glass-crabs, etc., belong. All of them are marine. They are most abundant in tropical seas, but some are found in those of temperate parts of the world. They have seven or eight pair of legs, mostly near the mouth. The gills are external, adhering to the appendages beneath the abdomen, which is elongated, and terminates in an extended tail-fin. The rings which bear the eyes and the antennæ are not confounded with the rest of the head, as in the *decapoda*, but are more distinct. The carapace often leaves the latter rings of the thorax exposed. The heart is very different from that of the *decapoda*, assuming the form of a long cylindrical vessel, which extends throughout the length of the abdomen.—The stomapoda inhabit deep parts of the sea, many of them living at the bottom, while some, as glass-crabs, are found floating at the surface.

STOMATA (Gr. mouths), are minute openings in the epidermis of leaves and other green parts of plants exposed to the air, communicating with intercellular spaces. Their existence was first noticed by Grew, who described them in his *Anatomy of Plants* in 1682. They are generally formed by two semilunar cells, which are as lips to the orifice, and are filled with green matter; but sometimes the cells arranged around them are more numerous. They are generally of an elliptical form, but sometimes circular, and sometimes quadrangular. These differences are very characteristic of particular species, genera, or orders of plants. In a moist state of the atmosphere, they are open; but when it becomes dry they are closed, or nearly so. It appears that they are organs of transpiration, and that their opening and closing according to the moisture or dryness of the atmosphere regulates it in a manner suitable to the requirements of the plant. They do not occur in any part of the plant covered by the soil, nor in submerged leaves, nor on the lower sides of floating leaves. Succulent plants have very few of them; so that these plants retain for a long time the moisture which they have imbibed, and are thus adapted for living in a dry atmosphere. Stomata are generally most abundant on the

under side of leaves; but in leaves which grow vertically, they are often almost equally numerous on both sides. In general they are irregularly placed; but in grasses and many other endogenous plants with parallel-veined leaves, they are in regular rows; and in some other plants they occur in little groups. The number in a square inch varies from 200 in the mistletoe, to almost 450,000 in the under side of the leaves of *solanum sanctum*.—Stomata are not found in mosses, lichens, algæ, and fungi; but they exist in some of the *hepaticeæ*, as in *marchantia*, in which their structure is more complex than in the higher plants; each of them consisting of a kind of shaft, composed of four or five rings placed one upon the other, every ring made up of four or five cells, and the lowest ring apparently regulating the aperture by the contraction or expansion of the cells which form it.

STONE, a weight in use throughout the n.w. and central countries of Europe, but varying much in different countries. It is chiefly employed on the continent for weighing wool, hemp, flax, and feathers, the flax-stone containing twice as many pounds as the one used for wool and feathers. In all the principal commercial states of Germany, the stone (of flax) is the $\frac{1}{2}$ of a cwt. (centner = 100 or 112 lbs.), i.e., 20 lbs., in Prussia and the Zollverein, Hamburg, Lübeck, and Bremen; 22 lbs. in Austria, etc.; in Britain it is the $\frac{1}{2}$ of a cwt., or 14 lbs.; while in Sweden it is equivalent to 32 lbs. In Great Britain, though the stone of 14 lbs. is the only legal imperial weight of the kind, stones of other values are in regular use, as a stone of 24 lbs. for wool, and one of 8 lbs. for butcher-meat.

STONE. See CALCULUS and LITHOTOMY.

STONE is used for a great variety of purposes—for building, paving, millstones, grindstones, hones, ornamental purposes, etc. Besides what is said under special headings (see BUILDING STONE, QUARRY, MILL, GRINDSTONES, HONES, MARBLE, GRANITE, SLATE, etc.), the following general remarks may be added here. The desirable properties in a building-stone are, that it should be compact, insoluble in water, not easily altered by the atmosphere, and not liable to take on a vegetable coating. These qualities depend upon its chemical composition and on its mechanical structure. Building stones may be divided into three classes—siliceous, calcareous, and composite. Siliceous stones (including granite, porphyry, gneiss, greenstone, basalt, sandstone, slate, serpentine, etc.), and containing from 45 to 99 per cent. of silica) are, as a general rule, the most durable for building. Their durability is affected by certain of their ingredients, as by the felspar in granite, and salts of iron in sandstone. Calcareous stones (simple limestone, travertine, marble, etc.), are slightly soluble in pure water, and more so in carbonic acid water; they are liable to splinter by water freezing in their pores, are acted on by acid gases (e.g., the sulphurous acid gas produced by the combustion of most kinds of coal), and are somewhat liable to be stained by minute plants. Still, some of them are lasting enough in a country atmosphere. The failure of the magnesian limestone selected for the British houses of parliament is a good instance of a stone lasting for centuries in a country church, and yet quite unable to withstand the wasting action of the atmosphere of a great city. Composite stones, in which neither the silica nor the lime greatly predominates, are unimportant.

The most exhaustive account of the building stones of the British islands is given in the parliamentary blue book embodying the report of the commissioners appointed to select a stone for the houses of parliament, published in 1839. Much scientific information regarding all kinds of stone will be found in the catalogue of the rock specimens of the museum of practical geology, London. See STONE, BUILDING.

STONE, a co. in n. Arkansas, drained by the White and Little Red rivers; pop. '90, 7043, with colored. The surface is uneven. The soil is fertile. The principal productions are corn, cotton, tobacco, and livestock. Area, 619 sq. m. Co. seat, Mountain View.

STONE, a co. in s.w. Missouri, adjoining Arkansas, drained by the James and White rivers, and traversed by the Chicago, Milwaukee, and St. Paul railroad, about 516 sq. m.; pop. '90, 7090, chiefly of American birth. The surface is uneven and heavily timbered. The soil is fertile. The principal productions are corn, wheat, tobacco, wool, and cattle. Iron and coal are found. Co. seat, Galena.

STONE, a market t. of Stafford, stands 7 m. n.n.w. of the town of that name, on the left bank of the Trent. Shoemaking, tanning, malting, and brickmaking are the chief branches of industry. Near the church are some remains of an Augustinian monastery. Pop. '91, 5754.

STONE, ARTIFICIAL. Artificial stone, properly speaking, would include burned clay wares used for building purposes, as bricks, terra-cotta (q.v.), etc., as well as the various cements. We shall confine ourselves here to a description of the silicious artificial stone produced by the cementing properties of soluble alkaline silicates on sand, which has excited a great deal of attention within the last 30 years. So far back as 1825, Prof. J. N. von Fuchs of Munich published a paper on various applications of these silicates, and so laid the foundation of a new industry. To M. Kuhlmann of Lille, however, is mainly due the merit of working out the practical application of the soluble silicate of potash or soda to the manufacture of hydraulic lime, cement, and especially to artificial stones. Mr. Frederick Ransome of Ipswich has also done great service by his success-

ful exertions in producing an artificial stone from the same substances. The process, as at first practiced by Mr. Ransome, consisted in mixing the gelatinous silicate of soda with sand and a little powdered glass and clay, in the proportions of sand, 10 parts; glass, 1 part; clay, 1 part; and silicate of soda, 1 part. These ingredients were thoroughly incorporated in a pug-mill, and brought to the consistency of putty. The plastic nature of the substance at this stage allows it to be molded with ease into an endless variety of forms, even of an elaborately ornamental kind. After leaving the molds, the objects are dried in close ovens, and then removed to kilns, where they are fired at a gradually increasing temperature, which finally reaches a red heat. In the kiln, the goods are bedded up in dry sand, to prevent any of the twisting or loss of shape which so commonly disfigures large objects in baked clay. When the firing is completed, the material is in the state of a semi-vitrified mass, with the appearance, properties, and composition of a fine sandstone.

A later patent of Mr. Ransome's consists in producing a hard and durable material altogether without baking, by effecting a double decomposition with the silicate of soda and the chloride of calcium. Such materials as sand, chalk, or other minerals are intimately mixed with a proper quantity of a solution of silicate of soda, this being secured, as before, by the operations of a pug-mill. In this plastic condition, they are molded into any required form, after which they are saturated with a solution of chloride of calcium. The silica combining with the calcium forms at once an insoluble silicate of lime, which cements into a firm mass all the particles of sand, lime, etc., used in the composition. The chlorine, on the other hand, combines with the soda to form common salt (chloride of sodium), which can be readily removed by washing.

The objects into which artificial stone is manufactured are very miscellaneous; whatever, in fact, is made of real stone can also be formed in the artificial. Among the more prominent applications of it, we may notice grindstones, millstones, tombstones, monuments, chimney-pieces, balustrades, fountains, vases, and statuary.

STONE, AMASA, b. Charlton, Mass., 1818; early engaged in the building of railroads and bridges; superintendent of the New Haven, Hartford, and Springfield railroad, 1845; one of the contractors for building the Cleveland and Columbus, and the Cleveland, Painesville, and Ashtabula railroads. Mr. Stone made improvements in the machinery and construction of railroads, and built car-factories and rolling-mills at the west. Mr. Stone, who resided at Cleveland, Ohio, made a donation of \$600,000 to Adelbert college of the Western Reserve university at Hudson, on condition of its removal to Cleveland,—an offer that was accepted. He d. 1883.

STONE, ANDREW LEETE, D.D., b. Conn., 1815; graduated at Yale college, 1837; professor in the deaf and dumb institution in New York for three years, and also studied theology; was for a time connected with the American Sunday-school union; ordained pastor of the South church (Congregational), Middletown, Conn., 1844; pastor of Park street church, Boston, 1849-65; was settled, 1866, in San Francisco, Cal. He has published *Service the End of Living*, and various discourses. In Boston he was noted as a pulpit orator, and has had much influence on the Pacific coast.

STONE, CHARLES P., b. Greenfield, Mass., 1824; graduate of West Point, 1845; assistant professor of ethics, 1845-46. He served in all the battles of the Mexican war from Vera Cruz to the capitulation of the city of Mexico. In 1851 he was assigned to the Pacific coast as chief of ordnance, and superintended the building of the arsenal at Benicia. He left the army in 1856; was a banker in San Francisco in 1856-57. He explored Sonora and Lower California in the service of the Mexican government. In 1861, under Gen. Scott, he organized and drilled the militia of the district for the defense of Washington. With the rank of col. of the 4th infantry and brig.-gen. of volunteers he fought under Gen. Patterson on the Shenandoah; also engaged on the upper Potomac. In 1862 he was detained for a few months in Fort Lafayette, in consequence of some reports to his disadvantage. In 1863 he took part in the siege of Port Hudson, and served soon after as chief of staff to Gen. Banks. After having been engaged in all the battles of the Louisiana campaign and commanding a brigade in the army of the Potomac, he was mustered out of the volunteer service, 1863, and in 1864 resigned his commission in the regular army. He was brig.-gen. and chief of staff in the service of the khedive of Egypt, 1870-82; superintended the erection of Bartholdi's statue, New York harbor; d. 1887.

STONE, DAVID MARVIN, b. Oxford, Conn., 1817; son of Dr. John Noah S.; engaged in mechanical and mercantile pursuits till 1849, when he succeeded David Hale on the editorial staff of the New York *Journal of Commerce*, of which paper he has been editor-in-chief for more than 20 years. He was also pres. of the New York associated press. In addition to much fugitive work, he has pub. *Frank Forrest* and *Memorial of an Only Daughter*. He d. April 2, 1895.

STONE, HORATIO, abt. 1810-75; b. New England; received a classical education; studied medicine and practiced in New York; turned his attention to art; became a sculptor and settled in Washington, 1846. He wrote for the press in prose and verse. He lived in Italy, 1856-57, returned to this country, and on a second trip abroad died in Carrara. His fame rests chiefly on his statues of Hamilton, Benton, Hancock, and Tanev, executed by order of the U.S. government.

STONE, JAMES KENT, D.D., b. Boston, 1840; graduated at Harvard college, 1861; studied in Italy and Germany, 1861-63; was ordained in the Protestant Episcopal church; professor of Latin, Kenyon college, Gambier, Ohio; afterward of mathematics, and became its president, 1867; elected president of Hobart college, Geneva, N. Y., 1868. In 1870 he became a Roman Catholic, and joined the association of missionary priests of St. Paul, New York. He published *The Invitation*, a statement of the reasons for his change.

STONE, JOHN HOSKINS, 1745-1804; b. Md.; entered the revolutionary army, in which he rose to be col. He was compelled to leave the service in 1779, in consequence of wounds received at the battle of Germantown. He was afterward a clerk in the state department, a member of the Maryland executive council, and governor of the state, 1794-97.

STONE, JOHN SEELY, D.D., 1795-1882; b. Mass.; grad. at Union college, 1823; studied in the General theological seminary, and was ordained in the Episcopal church, 1826; rector Christ church, Brooklyn, N. Y., and St. Paul's church, Boston, 1832-41; lecturer in Philadelphia divinity school; dean of the theological seminary, Cambridge, Mass., 1867-75. He published *The Mysteries Opened*; *The Christian Sabbath*; *The Church Universal*; *The Contrast*; *Life of James Milnor*; *Life of Bishop Griswold*; *The Christian Sacraments*. His ministrations were greatly prized in successive parishes.

STONE, LUCY. See BLACKWELL, LUCY STONE.

STONE, SAMUEL, 1602-63; b. England; graduated at Cambridge, 1627; curate of Stisted, Essex, 1627-30; became a Puritan, and was persecuted; emigrated to America, 1633, with Cotton, Hooker, and 200 others; was an assistant to Mr. Hooker, at Cambridge, Mass., 1633-36; removed to Hartford with Hooker, who later succeeded him. The latter part of his life was embittered by a dispute with Mr. Goodwin, a ruling elder, resulting in a division of the church. He published a *Discourse on the Logical Notion of a Congregational Church*, and left in MS. a valuable body of divinity.

STONE, THOMAS, 1743-87; b. Md.; studied law at Annapolis, Md. After his admission to the bar, 1764, he practised in Fredericktown, and later in Charles county. He was a member of the colonial and continental congress, 1775-79; warmly supported the movement for independence, and served on important committees. In 1783 he was again elected to congress.

STONE, WILLIAM LEETE, 1792-1844; born in New York state; a printer who edited several newspapers, including the *Albany Daily Advertiser*, the *Hartford Mirror*, and the *New York Commercial Advertiser*. He was superintendent of the New York common schools, 1843-44. Among his numerous works are *Tales and Sketches* (1834); *Essays on Social and Literary Topics* (1835); *Letters on Animal Magnetism* (1837); *Life of Joseph Brant* (1838); *Border Wars of the Revolution* (1839); and *Poetry and History of Wyoming* (1841).

STONE, WILLIAM LEETE, Jr., b. New York, 1835; educated at Brown university and the Albany law school. Among his writings are: *Life and Writings of Colonel William L. Stone* (1866); *History of New York City* (1872); and *Centennial Sketches* (1876). He has been an editor and a publisher.

STONE, WILLIAM OLIVER, 1830-75; b. Conn.; studied painting under Nathaniel Jocelyn in New Haven, and settled in New York in 1851. In 1854 he exhibited his first picture, "The Mantilla," at the national academy, of which he was made an academician in 1859. He was very successful as a portrait painter of women and children.

STONE-BORERS, certain species of lamellibranchiate mollusks belonging to the families *pholadidae*, *gastrochaenidae*, *mytilidae*, *veneridae*, and probably some others, which have the power of perforating stone. These animals are allied only by class characteristics, being all lamellibranchs. Their generic characters differ much, and their methods of excavations into rocks are various; but it is believed that the majority produce their mechanical effects by grinding with the anterior portions of their shells. There are also certain worms and echinoids which bore into rocks.

STONE, BUILDING (see BUILDING-STONE). The great merits of a stone for building purposes are easy working, long lasting, equality in color and structure, strength, and, not least important, cheapness. We have in this country almost unlimited supplies of excellent stone of every kind; but we are not really a stone-building race for two reasons—exorbitant freights and expensive labor. The divisions of stone from this point of view are not those of the science of petrography, owing to the methods of cutting and laying. Stones are laid in a wall sometimes roughly just as found, only taking care to get a plumb face; this is rubble-work. Again, they may be laid in lines depending on the thickness of the stone, but with butt-joints unequally distributed—coursing; or the courses may be leveled up only at every three or five rows, the joints between not necessarily vertical—random-coursing; or the stone is laid in courses of blocks, butt-joints at stated intervals—ashlar. The strength and the life of a stone depend upon its being laid upon its bed (the strata in a quarry are not always parallel with the horizon), and its having a level, true surface for pressure both received and distributed. It is, then, of great moment to the workman whether the stone can be separated parallel to the

bed—splittage; and also at right angles to it—cleavage. He divides, then, his material into freestones which split and cleave (gneiss and some trap also); slates which split (also basalts and some gritstones); limestones which cleave (some granites as well); tough stones which neither split nor cleave—granites and conglomerates (but here belong chalks, though so soft as to be good, in our climate, for inside carving only). The best construction has always been done in the hardest stone, and it is necessary to see how such an intractable material is reduced to shape. The workman knows two distinctions—of country-stone and quarry-stone. But the first, often occurring in boulders, is likely to be one of the toughest of all, though usually they are the easily reached outcrops of strata which are more likely to be sandstone or limestone. All quarries are poor and mottled in the top-beds, but the stone becomes better as it descends; also, more beds and of different thicknesses are struck, the only stones not lying in beds being chalk, conglomerates, and some granites, though even the latter have at intervals a definite line of split. The three heaviest tools in use are the hammer, the axe, and the pick. The block being reduced to a nearly rectangular shape, the edges are got to line with the axe, and a broad level edge of the width of a tool, called a draft, is put all around the face of the stone and brought true by the square and the level. The bossed, rectangular panel so formed may be left quarry-faced, picked, axed, or hammered; the last being a level surface pitted with small holes if made by the bush-hammer, or scored with parallel lines if made by the patent-hammer. This is the slow process of reducing to shape the tough stones. Moldings and ornaments are roughed out with the pitching-tool, a pointed chisel; with the mash-point, a chisel with one level; and finished with drafting and beveled chisels and tools of the necessary shapes and curves. The work is finally rubbed and polished, with emery and pumice-stone, if desired. This process is evidently much shortened when machinery is used. The saw for marbles is a plain strip of iron fed with sand; that for harder stones is of copper fed with emery. Freestones are cut with a grub-saw having coarse teeth at intervals; and chalk-stones with a heavy hand-saw with hooked teeth. Heavy stones are polished by power-rubbers, and manageable ones by themselves, being revolved over a large rubbing-table. Freestones and limestones can be planed by machinery, also turned; but no machine has yet succeeded in planing granite, though balusters have been roughly turned, or rather chipped to shape. The qualities of a building-stone to be tabulated are its color, strength, weight, absorption, and place of production, together with any peculiarities. The figures which follow are mostly due to the report of Gen. Gillmore on the “Building-stones of the United States.” Some foreign ones in general use are included.

GRANITES.

Color.	Place.	Strength per sq.in.	Weight per cubic ft.	Absorption.
Red.....	Bay of Fundy.....	12,000	162.	
Blue.....	Dix Island, Me.....	15,000	166.5	
Gray.....	Hurricane Island, Me.....	14,000	166.9	
Gray.....	Palmer quarry, Me.....	11,500	161.9	1.150
Light-gray.....	East Boston, Me.....	16,000	164.4	Bluish.
Whitish.....	City Point, Me.....	15,000	165.6	Like Breccia
Gray.....	Rockport, Mass.....	16,000	163.2	1.152 } Often feld
Whitish.....	Cape Ann, Mass.....	12,500	.....	..... } spathic.
Gray.....	Fall River, Mass.....	16,000	165.	1.216
Bluish-gray.....	Keene, N. H.....	12,000	166.	1.300
Dark.....	Quincy, Mass.....	17,000	166.2	
Light.....	Quincy, Mass.....	14,000	168.7	
Gray.....	Westerly, R. I.....	15,000	167.	
Dark.....	Westerly, R. I.....	17,000	165.6	
Gray.....	Mystic, Conn.....	18,000	164.4	
Rose.....	Niantic, Conn.....	9,550	162.5	1.704
Gray.....	Stony Creek, Conn.....	15,000	165.4	1.201
.....	North river, N. Y.....	18,000	162.2	
.....	Garrison's, N. Y.....	13,000	161.3	1.167
Soap.....	Jersey City, N. J.....	21,000	189.5	
Soap.....	Pompton, N. J.....	24,000	.....
Blue.....	Staten Island, N. Y.....	22,000	178.8	
Gray.....	Port Deposit, Md.....	19,000	170.	
Purplish.....	Huron Island, Mich.....	20,000	166.2	1.600
Dark.....	Duluth, Minn.....	17,000	.....
Light.....	St. Cloud, Minn.....	16,000	168.2	1.239

GNEISS.

.....	Sachemshead, Conn.....	14,000	163.7	1.162
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FALSE GRANITE.

.....	Chaumont Bay, N. Y.....	22,000	165.	1.500
.....	Chaumont Bay, N. Y.....	17,000	167.6	1.350

GRAYWACK.

.....	Greenwich, Conn.....	12,000	177	
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LIMESTONES.

Color.	Place.	Strength per sq.in.	Weight per cubic ft.	Absorption.
Black.....	Lake Champlain, N. Y.....	25,000	172.	
Dark.....	Kingston, N. Y.....	14,000	168.2	
Lighter.....	Garrison's, N. Y.....	18,000	164.7	
Blue.....	Williamsville, N. Y.....	12,000	165.	
White.....	Marblehead, O.....	11,000	159.	1.30
White.....	Joliet, Ill.....	14,000	159.	1.91
Bluish-drab.....	Cook co., Ill.....	12,000	165.3	1.89
Dark.....	Bardstown, Ky.....	16,000	167.	1.80
Drab.....	Lime Island, Mich.....	18,000	159.	1.80
Drab.....	Marquette, Mich.....	8,000	146.3	1.22
Bluish-drab.....	Sturgeon bay, Wis.....	20,000	173.8	1.399
Dark-drab.....	Cooper co., Mo.....	7,000	145.	1.25

MARBLES.

Common.....	Italian.....	12,000	168.2	
White.....	Dorset, Vt.....	8,000	165.	
White.....	Tuckahoe, N. Y.....	13,500	175.	
Drab.....	Quincy, Ill.....	9,500	160.	1.180
Drab.....	Door co., Wis.....	20,000	175.	

SANDSTONES.

Brown.....	Middletown, Conn.....	7,000	148.5	1.40
Brown.....	Little Falls, N. Y.....	9,500	140.6	1.34
Brown.....	Albion, N. Y.....	13,500	151.2	1.44
Gray.....	Belleville, N. J.....	11,500	141.	1.27
Red.....	Haverstraw, N. Y.....	4,000	133.	1.23
Pink.....	Medina, N. Y.....	17,000	150.6	1.55
Drab.....	Berea, O.....	8,000	133.5	1.20
Drab.....	Vermilion, O.....	8,000	135.	1.19
Brown-gray.....	Amherst, O.....	6,000	136.	1.19
Red-brown.....	Seneca, O.....	10,000	149.3	1.32
Olive-green.....	Cleveland, O.....	7,000	140.	1.37
Gray.....	Berlin.....	14,000	....
Yellow-drab.....	Massilon, O.....	9,000	132.	1.18
Purple.....	Marquette, Mich.....	7,000	142.	1.32
Purple.....	Fond du Lac, Wis.....	6,000	139.	1.22
Pink.....	Le Sueur co., Minn.....	11,000	164.4	1.56
Light-buff.....	Frontenac, Minn.....	6,000	145.3	1.28
Bluish-drab.....	Warrenburg, Mo.....	5,000	134.	1.20
Whitish.....	Craigleith, Scotland.....	12,000	141.3	1.34
Gray.....	Dorchester, N. B.....	9,000	
Olive.....	Dorchester, N. B.....	6,000	

CHALK.

Yellow-gray.....	Caen, France.....	3,500	119.	1.19
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Red, purple, and green slate are found on Lake Champlain and in Vermont; black and deep purple in New Jersey and Pennsylvania; fine colored marbles are found near Lake Champlain and the St. Lawrence River, in West Virginia, in Tennessee, and in California. In the above table all crushing strength is taken on the bed. When that taken on edge is greater—very rarely—it shows a formation like that of a gneiss. A heavy stone, of high crushing strength and no absorption, is sure to be a good building-stone, unless it contain iron. If not homogeneous, like the Chaumont limestone, usually called a granite, which shows shells when rubbed, it should never be more than fine-worked. All stones are bettered by a certain exposure before laying—a weathering; and for sandstones it is indispensable. Chalks, which harden by exposure, can be cut with a light mallet when built in the wall.

STONE-CHAT, *Saxicola rubicola* (see CHAT), one of the most common of the British *syliadae*, a pretty little bird, rather smaller than the redbreast, black on the upper parts and throat in summer; the breast of a dark reddish color; some white on the sides of the neck, the wings, and the tail. It makes its nest on the ground, or on a low branch. Some stone-chats spend the winter in Britain, but the greater number migrate to more southern regions.

STONECROP. See SEDUM.

STONE-CUTTING AND DRESSING MACHINES. Stone is a substance which in none of its varieties is easily operated on by machinery, owing chiefly to its brittleness, its unequal hardness, and the natural cracks which so frequently impair its solidity. Accordingly, though many ingenious machines have been invented for working stone, it is as yet only in some of the plainer kinds of work that they can be said to have entirely superseded hand operations.

Some stones and slates are soft enough to be cut with ordinary toothed saws much in the same way as wood is cut. More generally, however, the sand-saw is employed, which we shall presently describe in noticing marble-cutting. For the cutting of com

mon kinds of stone, which are not to receive a fine polish, a machine, which promises to be very efficient, has been recently patented by Mr. George Hunter of Maentwrog, Caernarvon, and is now in operation at various large quarries, both of stone and slate. The cutting portion consists of a circular disk, round the circumference of which a number of pointed steel tools are fixed into sockets, thus giving it the appearance of a large toothed saw. This machine will cut sandstone at the rate of 5 to 6 in., slate at 3 in., and soft limestone at 3 in. per minute, supposing these to be in blocks each 2 ft. thick.

So far as the sawing or slicing of stones is concerned, the tendency of late years is to rely on the use of the diamond—the dull black variety which is of no use as a gem. Some American stone-cutting machines have saws with teeth set with these diamonds, and are said to cut ordinary sandstone at the rate of 75 sq. ft. per second for each saw. Machines for dressing the face of stones by means of a series of chisels in imitation of the handwork of the mason have recently been tried and have given fair results.

It is considerably more than a century since machinery for sawing and polishing marble was first established at Ashford, near Bakewell, in Derbyshire, that county being still the seat of the principal marble manufacture of England. Marble is cut into slabs by means of a series of thin plates of soft iron used like saws, but having no teeth. The saw-blades are fixed into a rectangular frame, to which a reciprocating horizontal motion is given. The block of marble to be cut rests on a carriage below the frame, and a small rill of mixed sand and water is constantly falling into the saw-cuts.

After the marble has been sawn into slabs it is cut up into narrow pieces, when so required, by means of small circular saws with smooth edges, sand and water being employed as above.

The sawn slabs are next submitted to the grinding process. This, for pieces of moderate size, is usually done upon a large circular cast-iron plate, called a *sanding-bed* or *grinding-bed*, mounted upon an upright spindle, and supplied with sand and water. The workman places the piece of marble with its face downward upon the grinding-bed, and exerts the proper amount of pressure. The marble is held in its place by means of guide-rods stretched across the plate. Slabs too large to be manipulated in this way are ground with plates of iron operating upon their surface.

The marble, when properly ground, is polished on a polishing bed or table, with an arrangement for securely fixing it while the rubbing is being proceeded with. The polishing rubbers are sometimes blocks of wood faced with felt, and sometimes bunches of hemp compressed between two side-plates. They are attached to a swing-frame with a pendulum-like motion, which draws them backward and forward over the surface of the marble. Flour emery is used to charge the rubbers in the first instance, and putty-powder (oxide of tin) for the finishing polish. Instead of emery sometimes the fine-grained stone known as water of Ayr stone is used to prepare the marble for the putty-powder.

Cylindrical objects, such as columns or vases, are first formed roughly into shape with a hammer and chisel, and then turned, with a pointed steel tool, upon a lathe, to which a slow motion is given. When thus brought to an accurate form, a rapid motion is given to the lathe, and the tool-marks ground away by the use of coarse, and then fine, and still finer sandstones—the polishing being completed with emery and putty-powder while the object is still upon the lathe.

Machinery is also applied to the production of flat objects with curved and molded outlines. The machine for this purpose operates by the use of a rotatory cutter, which is guided in its action by a template formed accurately to the intended shape of the article.

The cutter is of steel or stone, and is attached to the lower end of a spindle driven by beveled wheels. There is a flange which allows the cutter to penetrate the marble till it reaches the template and no further. In the process of cutting the marble is constantly drawn up against the cutting-tool by two weights, the one pulling the table in one direction, the other the carriage on which the table rests, in a direction at right angles to the former, thus compelling the cutter to follow the outline of the template. The shape of the cutting-tool is, of course, exactly the reverse of the molding to be formed.

In the cutting and polishing of granite, the machinery and processes are so nearly the same as those employed for marble, that it is unnecessary to describe them separately. Suffice it to say, that all objects to which the sawing apparatus cannot be applied, require to be worked to shape with great care by means of steel chisels and iron mallets, which only remove small portions at a time. Owing to the great hardness of the material, any defect in the chiseling greatly increases the labor of polishing. So slow, indeed, are the operations with granite, that a saw-blade will not cut through an inch in depth during a whole day, and a good-sized sawn slab will take a week to polish.

STONE-FLY, *Perla*, a genus of neuropterous insects, of the tribe or family *planipennes*. The hind wings are broader than the fore-wings, and folded at the inner edge. The body is elongate, narrow, and flattened; the wings close horizontally on the body; the abdomen is generally terminated by two bristles (*setæ*). The larvæ are aquatic, and much resemble the perfect insect, except in the want of wings. A number of species are common in Britain, and are well known to anglers as an attractive lure for fishes.

STONE-FRUITS, in popular language, are those fruits which are botanically designated *drupes*, and in which the rind is fleshy, and the putamen bony. Many of the finest dessert fruits are of this description. Those best known in temperate climates generally belong to the natural order *rosaceæ*, sub-order *amygdaleæ*, the order *drupaceæ* of Lindley, as the peach and nectarine, plum, cherry, apricot, etc. In tropical countries, many stone-fruits occur, belonging to *chrysobalanaceæ* and other natural orders.

STONEHAM, a town in Middlesex co., Mass.; on the Boston and Maine railroad; 13 miles n. of Boston. It was incorporated in 1725; has street railroad connection with Woburn and Boston, a high school, public library, national and savings banks, weekly newspapers, and an assessed property valuation of over \$4,300,000; and is noted for its extensive manufactories of shoes and its large tanneries. Pop. '90, 4890.

STONEHAVEN, a sea-port t. of Scotland, capital of the co. of Kincardine, and a station on the railway from Dundee to Aberdeen, is situated on a rocky bay at the mouth of Carron Water. It is divided into an old and new town, on different sides of the river, and connected by a bridge. The harbor can admit only small vessels. Stonehaven has very considerable haddock and herring fisheries, and some slight manufactures. Pop. '81, 3,957. Two miles s., on a projecting rock, stands the famous castle of Dunnotar, once the residence of the Earls Marischal.

STONEHENGE (Sax. *Stanhengist*, hanging or uplifted stones), a very remarkable structure, composed of large artificially raised monoliths, situated on Salisbury plain, two miles from the town of Amesbury, in Wiltshire. Its neighborhood abounds in sepulchral tumuli, in many of which ancient British remains have been found. The fabric of Stonehenge, which was comparatively entire in the early part of the present century, has been so much defaced in recent times as to be at first view little more than a confused pile of moss-grown stones; but a minute inspection will still enable one to trace its original form. When entire, it consisted of two concentric circles of upright stones, inclosing two ellipses, the whole surrounded by a double mound and ditch circular in form. Outside the boundary was a single upright stone, and the approach was by an avenue from the n.e., bounded on each side by a mound or ditch. The outer circle consisted of 30 blocks of sandstone, fixed upright at intervals of $3\frac{1}{2}$ ft., and connected at the top by a continuous series of imposts, 16 ft. from the ground. The blocks were all squared and rough-hewn, and the horizontal imposts dovetailed to each other, and fitted by mortise-holes in their under sides to knobs in the uprights. About 9 ft. within this peristyle was the inner circle, composed of 30 unhewn granite pillars, from 5 to 6 ft. in height. The grandest part of Stonehenge was the ellipse inside the circle, formed of 10 or 12 blocks of sandstone, from 16 to 22 ft. in height, arranged in pairs, each pair separate, and furnished with an impost, so as to form 5 or 6 trilithons. Within these trilithons was the inner ellipse, composed of 19 uprights of granite similar in size to those of the inner circle; and in the cell thus formed was the so-called altar, a large slab of blue marble.

There has been much speculation regarding the origin and purpose of Stonehenge, which are still involved in much obscurity. A curious legend, first found in the *British Chronicle* of the 10th c., and repeated by Geoffrey of Monmouth and Giraldus Cambrensis, ascribes it to Emrys or Ambrosius, the last British king, who, in the 5th c., aided by the incantations of the magician Merlin, is said to have erected it in memory of 460 Britons, who were murdered by Hengist the Saxon. In modern times, the most prevalent opinion has been that, in common with other similar structures elsewhere, it was a temple for Druidical worship; but this belief has been somewhat shaken by the discovery of the sepulchral character of many other monuments, which had been also presumed to be Druidical. The circular form has suggested the idea of a connection with the worship of the sun; and Stonehenge may possibly have been used for the religious rites of various successive races and creeds; and also as a court of justice or battle-ring for judicial combats. The outer circle is evidently of a much later date than the rest, and seems to belong to a period when iron tools were in use. See **STANDING STONES**.

STONEHOUSE, EAST, a parish of Devonshire, included within the limits of the parliamentary borough of Devonport (q.v.), and forming in effect a portion of Plymouth (q.v.). Among other government establishments, it contains the Royal William victualling yard, naval hospital, and marine barracks capable of accommodating 1500 men. Pop. of parish '91, 15,401.

STONEMAN, GEORGE, b. N. Y., 1822; graduated at West Point, 1846, and was commissioned in the cavalry. In 1861 he was in command of Fort Brown, Texas, and refused to obey Gen. Twiggs's order to surrender the government property in his charge to the secessionists, but evacuated the place and brought his command to New York on a steamer. He took part in the battle of Williamsburg and the second battle of Bull Run, and commanded the 3d corps at Fredericksburg. In the Richmond campaign Gen. Stoneman had command of the Ohio cavalry. He was also engaged in the movement on Atlanta, commanded the military district of e. Tennessee, and captured Salisbury, N. C., and Asheville. He retired from the army in 1871 with rank of col. and brevet rank of maj.-gen.; resigned, 1882; governor of California, 1883-87. Died Sept. 5, 1894.

STONE PERIOD. See **BRONZE**, **AGE OF**.

STONE-POCK, an old name for a variety of modified small-pox, in which the vesicles dried up into hard tubercles instead of proceeding onwards to maturation.

STONE, PRESERVATION OF. The mechanical preservation of stone can be effected to a great extent by coating the surface with boiled linseed oil, or with oil-paint; but these methods are not much in favor, as they destroy the crystalline appearance which constitutes the beauty of most natural stones. As promising a better result, many experiments have been tried, especially of late, with certain chemical solutions that are not likely to mar the inherent beauty of a stone. The substances which have been most used are those soluble silicates which we have referred to under **STONE, ARTIFICIAL**. The earlier process of Kuhlmann consisted in coating the surface with a soluble silicate of soda or potash, which is also known by the names of soluble glass, water-glass, and flint liquor. This was applied with a brush, and silification was produced by the silica of the solution entering into combination with the lime of the stone; but this took a considerable time, so that, on an exposed front, it was liable to be washed out before the proper hardening took place. The later process of Ransome consists in cleaning the surface of the stone from extraneous matter, and then applying alternate solutions of the above alkaline silicate and chloride of calcium, which forms an insoluble silicate of lime in the pores of the stone. This plan has been tried with a portion of the new houses of parliament many years ago, and is now extensively used in London, Edinburgh, Glasgow, and elsewhere. Ransome's process is indeed practically the only one in use. But the preservation of the houses of parliament has been the subject of inquiry since this invention was applied to them; and the committee which sat did not succeed in discovering any preserving agent which they felt justified in proposing. The chemists engaged in this inquiry selected, from a vast number of proposals then made, the following processes, as claiming a careful investigation: 1. Application of silicates of the alkalis, in various states of concentration; 2. Application of silicates, in conjunction with various saline compounds, intended to produce double decomposition; 3. Application of hydrofluoric or hydrosilicic acid, or their saline compounds; 4. Application of phosphoric acid and acid phosphates; 5. Applications of solutions of the alkaline earths, or their bicarbonates, in water.

STONE RIVER, BATTLE OF. See **MURFREESBORO**.

STONEWALL, a co. in n. western Texas, watered by the Brazos river; 900 sq. m.; pop. '90, 1024. Co. seat, Rayner.

STONEWALL, a magisterial dist., Rockingham co., Va. Pop. '90, 6764.

STONEWALL JACKSON. See **JACKSON**, **THOMAS JONATHAN**.

STONE-WARE. See **POTTERY**.

STONINGTON, a town and port of entry in New London co., Conn.; on Long Island sound and the New York, New Haven, and Hartford railroad; 12 miles e. of New London. It was incorporated in 1658; contains the borough of Stonington (incorporated 1801) and the villages of Mystic, Old Mystic, and Pawcatuck; and has a fine harbor, high schools, an English and classical institute, public library, public park, containing guns used in the successful defense of the town against the British fleet in 1812, a national bank, and weekly newspaper. It is on the line of regular steamboat communication between Providence, R. I., and New York. The manufactures include machinery, printing-presses, and woolen and velvet goods. Pop. '90, 7184.

STONY POINT, a town and village in Rockland co., N. Y.; on Haverstraw bay (Hudson river), and the New Jersey and New York, the New York, Ontario, and Western, and the West Shore railroads; 42 miles n. of New York. It was fortified by Americans early in the revolutionary war, captured by Sir Henry Clinton, 1779, and garrisoned; retaken by Gen. Anthony Wayne, July 16, 1779, with 1200 men in his command, by a sudden midnight attack, cutting off the sentries, and carrying the fort at the point of the bayonet, under a heavy fire of musketry and grape-shot, capturing 543 officers and men; American loss, 15 killed and 83 wounded; British, 63 killed. This was called by Gen. Charles Lee not only the most brilliant assault in the whole war on either side, but the most brilliant in history; the assault of Schveidnitz by Marshal Laudon he considered inferior to it. The simultaneous attack on Verplanck's Point being unsuccessful, the Stony Point works were destroyed and abandoned in obedience to Washington's orders. It has several churches, schools, and manufactures of brick and lime. Pop. '90, town, 4614.

STOOL OF REPENTANCE, the name ordinarily given in Scotland to a low stool conspicuously placed in front of the pulpit in churches, on which persons who had become subject to ecclesiastical discipline for immoral conduct were required to sit during public worship, in profession of their penitence, or on which they stood at the close of the service to be "rebuked" by the minister. It was also familiarly called the *cutty* stool, a term applied to small stools of similar form, common in houses, but which came to be often employed in conversation and in humorous verses with special reference to that which stood in the church. Transgressions of the seventh commandment being far more frequently the cause of occupying the stool of repentance than offenses of any other kind, the jokes which abounded on the subject of this piece of church-furniture were neither indicative of a pure morality nor calculated to promote it.

STOP, or **REGISTER**, a name given to the different ranges of pipes in an organ. Each stop consists of a series of pipes, of the same quality of tone, extending throughout the whole or a large part of the compass of the instrument, and furnished by a draw-stop or knob, on drawing which out, the air is admitted to the particular stop, so that the keys will play on pipes of that character. Some of the stops do not give the note which corresponds in pitch with the key struck, but a note an octave or two octaves lower, or one of the harmonics higher in pitch. Compound or mixture stops consist of more than one row of pipes to each key, corresponding to the different harmonics of the ground tone. The stops of different organs vary much in number and kind; a very large number are to be found in many of the organs in Germany and Italy. See **ORGAN**.

STOPPAGE IN TRANSITU is a valuable right or privilege of a vender of goods to resume possession, after he has parted with them under a contract of sale, and before the goods have reached the vendee. It occurs when goods are consigned entirely or partly on credit from one person to another, and the consignee becomes bankrupt before the goods arrive. In this event, the consignor has a right to direct the captain of the ship or other carrier to deliver the goods to himself or his agent instead of the consignee, who has thus become unable to pay for them. This right was first allowed as equitable by the court of chancery, and the courts of common law followed the example. There are certain circumstances, however, in which the right to stop *in transitu* may be defeated, as where the consignee of the goods indorses the bill of lading to a *bonâ fide* indorsee. When the vendee has appointed the carrier who is to receive the goods, their delivery to the carrier is treated for many purposes as delivery to the vendee himself; yet it is not too late for the vendor to stop the goods so long as they have not come into the actual possession of the vendee. The right to stop *in transitu* is not allowed to a vender unless in case of the bankruptcy of the vendee or his stoppage of payment. This general rule is in reality an extension of the right of lien, and is a remedial right of a vender. The *stoppage in transitu* does not do away with the sale, nor does the seller reacquire absolute ownership in the property. If, after the return of the property to the hands of the vender, the vendee demand that the contract be carried out he may enforce such demand. It is not necessary that the insolvency should occur *after* the sale; if, at the time of the bargain the vendee was in fact insolvent and the vender was ignorant of that fact, the right of stoppage accrues. The power may be exercised so long and only so long as the goods remain within the custody of middlemen employed to complete the transit, or agents of the vender. When the goods come within the custody of the vendee or his agent, the vender comes into the position of any other creditor. It has been held that where coal was delivered by a railroad company on a wharf belonging to itself, but of which it had been accustomed to allow the vendee the sole use (without consideration) the control of the corporation had ceased, and the right of stoppage *in transitu* no longer existed. So where the goods are stored in a bonded warehouse and the usual bonds are given by the vendee, the vender's right no longer exists. If the consignee have assigned the *bill of lading* regularly indorsed and forwarded by the consignor, the bill is now regarded as a *quasi* negotiable instrument; and it seems well established that the right of stoppage is destroyed by the assignment. The method of exercising the right is by notice to the middleman or common carrier, forbidding him to deliver the goods to the vender, and demanding their return. If this be disregarded a right of action accrues to the vender as against the middleman, separate from his right to recover the goods, from the vendee or his assignee. The right of recovery is subject to the common carrier's lien.

STOPPAGES, MILITARY AND NAVAL, in Eng. are deductions made from the pay of officers and men, in consideration of supplies made to them, or in aid of certain institutions. These stoppages were formerly more numerous than now. Thus, every officer and man had to pay toward Chelsea and Greenwich hospitals, and a soldier had to pay for his kit by a stoppage from the bounty. These stoppages have been remitted. Those now remaining are, under ordinary circumstances, limited in the navy to payment for slops (i.e., clothing) issued to men, or for willful damage: in the army, for forage, 8d. each ration by cavalry officers, and 6d. for artillery officers (though their horses eat the same); for messing on board ship; for diet in hospital, if sick through the man's own fault; for cost while in prison; for damages to barracks; and as a fine.

STORAGE BATTERIES. See **ELECTRIC MOTORS**; **MAGNETO-ELECTRIC MACHINES**.

STORAX, a fragrant resinous substance, the *styrax* of the ancients, obtained from the storax tree (*styrax officinalis*), a native of the countries around the Mediterranean sea, and belonging to the natural order *styracaceæ*, an order of exogenous plants, containing more than 100 known species. The species of this order are found in the tropical and sub-tropical parts of Asia, extending also into Europe and Africa, and the warm parts of America. *Styrax officinalis*, which produces storax, is a tree of 15 to 20 ft. high, a native of the Levant. Storax is obtained by wounding the bark, when it exudes and hardens in the air. It appears in the form of reddish-yellow tears about the size of a pea, opaque, soft, and adhesive; or in dry brittle masses, wrapped in the leaves of a kind of reed, when it is called *S. calamita*. Storax has a fragrant odor and an aromatic taste, and is stimulating and expectorant. It was formerly much more in use in medicine than now.

Benzoïn (q. v.) is the produce of a species of *styrax*. The *liquid storax* of the shops is doubtfully regarded either as produced by *styrax officinalis*, or by a species of *liquidambar* (q. v.). It seems probable that there are two kinds.

STOREY, a co. in w. Nevada, drained by the Carson and Truckee rivers, traversed by the Southern Pacific and the Virginia and Truckee railroads; about 270 sq. m.; pop. '90, 8806. The surface is mountainous. The soil is poor. The gold and silver mines of this county are very rich, including the great Comstock lode. Co. seat, Virginia City.

STOREY, WILBUR FISK, b. Vt., 1819; entered the printing business in which he served an apprenticeship, and went to New York, where he obtained a position in the office of the *Journal of Commerce*. He removed to Laporte, and afterward to Mishawaka, Ind.; the first in 1838, the second three years later; in both towns attempting to establish a democratic weekly newspaper, but without success. In 1842 he made a similar venture at Jackson, Mich.; and in 1854 bought the *Detroit Free Press*, which he conducted until 1861, when he bought the *Chicago Times*. The latter paper he succeeded in establishing on a firm basis, making it one of the most successful papers in the west. He d. 1884.

STORK, *Ciconia*, a genus of birds of the same family (*ardeidæ*) with herons and bitterns; large birds; with long legs, four-toed, the three front toes webbed to the first joint; the tail short; the wings large; the bill longer than the head, straight, strong, pointed, and without any groove, the nostrils pierced longitudinally in the horny substance; the eyes surrounded by naked skin. The species are not numerous, but they are of very wide geographic distribution. The COMMON STORK, or WHITE STORK (*C. alba*), is a native of the greater part of the Old World, a migratory bird, its range extending even to the northern parts of Scandinavia. It is common in most parts of Europe. It is about 3½ ft. in length. The head, neck, and whole body are pure white; the wings partly black; the bill and legs red. The neck is long, and generally carried in an arched form; the feathers of the breast are long and pendulous, and the bird often has its bill half hidden among them. The stork frequents marshy places, feeding on eels and other fishes, batrachians, reptiles, young birds, and small mammals. It makes a rude nest of sticks, reeds, etc., on the tops of tall trees, or of ruins, spires, or houses. In many parts of Europe, especially in Holland, it is a very common practice to place boxes for storks, and it is considered a fortunate thing for a household that the box on the roof is occupied. Storks are protected by law in some countries, on account of their good services not only in destroying reptiles and other troublesome animals, but in the removal of offal from the streets of towns, in which they stalk about with perfect confidence, even in the midst of throngs of people. They have been celebrated from ancient times for the affection which they display toward their young; and have also had the reputation—not so well founded—of showing great regard to their aged parents. Before they take their departure from their summer haunts, they congregate in large flocks, which make a great noise by the clattering of their mandibles, and are popularly regarded as holding consultation. The stork has no voice. Its flight is powerful, and very high in the air. It has ever been a very rare bird in Britain. The flesh of the stork is rank, and not fit for food. See illustration, BIRDS, vol. II., fig. 21.—Another species, the BLACK STORK (*C. nigra*), rather smaller, the plumage of the upper parts glossy black, the under parts white, is also common in many parts of Europe, Asia, and Africa.—The SOUTH AMERICAN STORK (*C. maguari*) is very similar to the common stork.

STORMONT, a co. in e. Ontario, having the St. Lawrence river for its s. boundary; drained in the n.w. by the Little Nation river; 260 sq.m.; pop. '91, 27,156. It is traversed on the St. Lawrence shore by the Grand Trunk railway. The surface is uneven, diversified by small streams, and thinly timbered, except in the neighborhood of the water-courses. Co. seat, Cornwall.

STORMS are violent commotions of the atmosphere, occurring in all climates, particularly in the tropics, and differing from other atmospheric disturbances in the extent over which they spread themselves, their destructive power, and the sudden changes which take place in the direction of the wind. There is, perhaps, no question in science in which there has been so large an admixture of speculation with fact, as in the attempts made to reduce the phenomena attendant on storms under general laws; the reason being, that meteorological observatories were too few in number, and too wide apart, to enable any one to give the barometer pressure, the general course of the winds, and the rainfall, without drawing largely on conjecture. Now, however, owing to the growing popularity of meteorology, and the countenance happily given to it by most civilized nations, sufficient data may be obtained for a fuller and more satisfactory statement of the facts. See METEOROLOGY: SIGNAL SERVICE OF THE U. S.: WEATHER.

We subjoin two charts of Europe, showing, from actual observations made at upward of 100 localities scattered over that continent, the barometric pressure, and direction and force of the wind, at 8 A.M. of the 1st and 2d of Nov., 1863, during part of the course of two storms which passed over Europe at that time. The isobarometric lines, or lines showing where, at the above hours, the height of the barometer was the same, are given for every two-tenths in the difference of the pressure. Hence, where these lines approach near each other, or crowd together, the difference of pressure, or the atmospheric distur-

ance, was the greatest; and the least where they are most apart—a distinction of the utmost importance in determining where the storm may be expected to rage in greatest fury. The arrows show the direction of the wind, being represented flying with it. The force of the wind is shown (1) by plain arrows, which represent light and moderate winds; (2) by arrows feathered on one side only, which represent high winds; (3) by arrows feathered on both sides, which represent strong gales, storms, or hurricanes.

The mean atmospheric pressure, at the level of the sea, may be stated to be 29.9 inches. When, therefore, the barometer falls below 29.9, the equilibrium of the atmosphere is more or less destroyed, according to the amount of the fall, and it is within this *area of low barometer* that a storm may be expected to occur. Hence, while we trace these low pressures, as they advance over the earth's surface from day to day, we trace at the same time the progress of the storms.

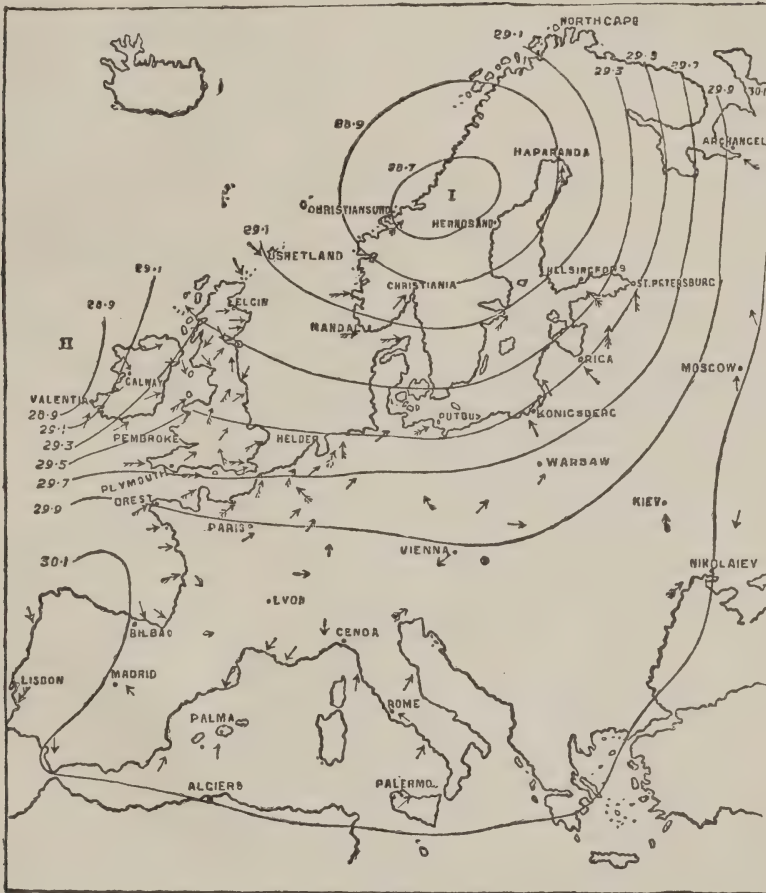


FIG. 1.—At 8 A.M., Nov. 1, 1863.

Form and Extent of Storm Areas.—The circular isobarometric lines on the charts represent very accurately the general shape storms assume. The area of almost every storm is either circular or slightly elliptical, and when elliptical, the major axis of the ellipse seldom exceeds twice the length of the minor axis. Rarely in Europe, but in America less rarely, the form of storms is much more elongated. The outline is occasionally very irregular, but in all such cases the storm will be found to have parted into two or more distinct storms, which remain separate for some time and then reunite. This circular form of storms, which an examination of some hundreds, especially in Europe, has shown to be their general characteristic, is a most important feature, whether as determining the practical rules for the guidance of sailors in storms, or for the forecasting of storms at particular sea-ports, in respect of the direction from which they may be expected to come, and the veerings of the winds during their continuance. The extent over which storms spread themselves is very variable, being seldom less than 600 miles in diameter, but

often two or three times that amount, or even more. Almost the whole of Europe is sometimes overspread by a single storm at one time. The area of storms is by no means constant from day to day, but varies in size, sometimes expanding and sometimes contracting. And it is worthy of remark that when a storm contracts its area, the central depression gives signs of filling up, and the storm of dying out. On the other hand, when it increases in extent, the central depression becomes deeper, the storm increases in violence, and occasionally is broken up into two, or even three, depressions, which become separate storms, with the wind circling round each.

Direction in which Storms advance.—It may be premised that by the direction of a storm is meant, not the direction of the wind, but the path followed by the center of disturbance. The direction in which their progressive motion takes place differs in different parts of the world, being probably determined by the prevailing winds. See WIND. Thus, about half the storms of middle and northern Europe travel from the s. w. toward the

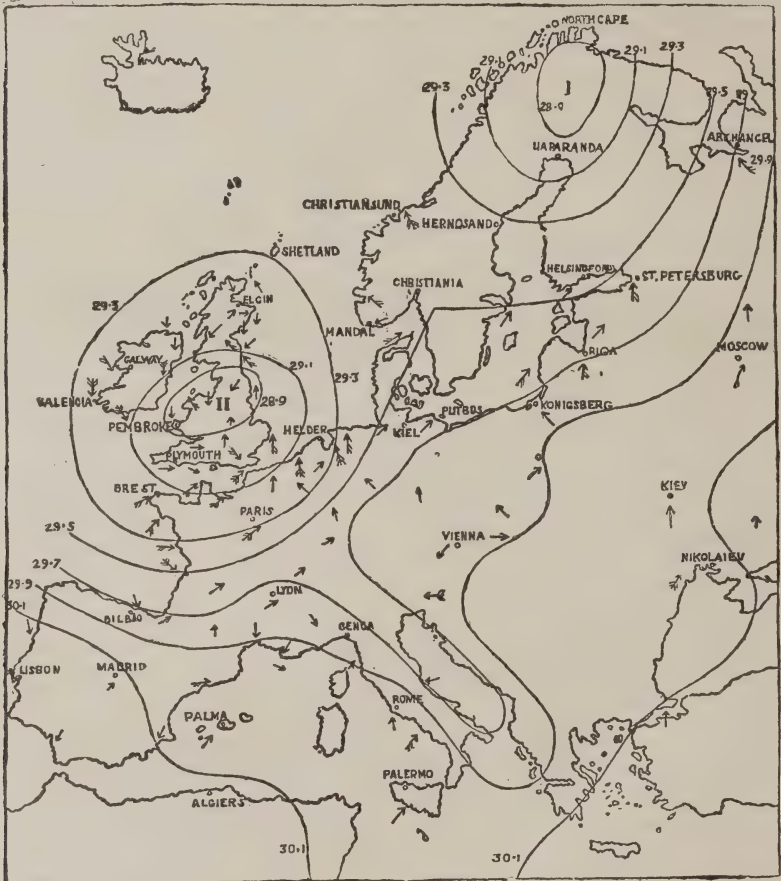


FIG. 2.—At 8 A.M., Nov. 2, 1863.

n.e., and 19 out of every 20, at least, travel toward some point in the quadrant from the n.e. to the s.e. Observation shows that the longer axis of the storm is almost always coincident with the direction in which the storm appears to be moving at the time. Storms do not always proceed in the same uniform direction from day to day, and though the change which occurs in the direction of their progressive motion is generally small, yet occasionally it is very great. Thus, of the many interesting features peculiar to the storm which passed over Europe in the beginning of Dec., 1863, none were more remarkable than the sudden changes of its progressive motion. It was first observed on the w. of Ireland, from which it advanced e. to Liverpool, then turned s. through Worcester and Oxford to Cherbourg in France; it thence retreated n. through Oxford to Shields, from which it proceeded e. to Copenhagen. By the time it arrived at Copenhagen its extent was only a fourth of what it had been the previous day, and the central depression half an inch less. Twelve hours later, the atmospheric equilibrium was restored, the storm having died out on reaching the Baltic sea. The storms of the Med-

iterranean follow a different course. Many of them proceed from the n. to the s., influenced probably by the heated air rising from the Sahara; a considerable number proceed from the e., and pass to the westward over Greece and Italy to the Alps; while very few are observed to travel in an easterly direction. By far the greater number of the storms of North America take their rise in the vast plain which lies immediately to the e. of the Rocky mountains, and thence advance in an eastern direction over the United States; some of them, crossing the Atlantic, burst on the western shores of Europe. But the relation of the American to the European storms is not well established, nor will be till observation has collected more facts, and discussion has sifted their significance. If once the connection be fully established, the system of forecasting storms to European ports will become much more certain and complete than it is at present. The storms of the West Indies generally take their rise from near the region of calms, and tracing out a parabolic course, proceed first toward the n.w., and then turn to the n.e. about 30° n. lat., many of them traversing the e. coasts of North America as far as Nova Scotia. South of the equator they follow an opposite course. Thus, in the south Atlantic and Indian ocean they first proceed toward the s.w., and then gradually curve round to the s.e. The hurricanes of Hindustan usually pursue a parabolic path, first traversing the eastern coast toward Calcutta, and then turning to the n.w. up the valley of the Ganges. The typhoons of the Chinese seas resemble, in the course they take, the hurricanes of the West Indies. Observations are wanting from other parts of the world to determine the course of storms.

Probably the course tracked out by storms is determined by the general system of winds which prevail, modified by the unequal distribution of land and water on the surface of the globe. Facts seem at present to point to this general conclusion, viz., *Storms follow the course of the atmospheric current in which the condensation of the vapor into the rain which accompanies them takes place.*

Rate at which Storms travel.—If the position of the center of Storm I. on Nov. 2 be compared with its position on the 1st on the charts, it will be found to have traveled 420 m. in 24 hours, or at the rate of $17\frac{1}{2}$ m. an hour. Similarly Storm II. will be found to have traveled in the same time 400 m., or at the rate of $16\frac{2}{3}$ m. an hour. This is about the average rate of the progressive movement of European storms. Sometimes, however, it falls as low as 15 m. an hour, and sometimes increases to 30 m. an hour. Within the tropics the onward motion of storms sometimes rises to 40 m. an hour.

Relations of Temperature, Rain, and Cloud to Storms.—The temperature increases a few degrees at places toward which and over which the front part of the storm is advancing, and falls at those places over which the front part of the storm has already passed. In other words, the temperature rises as the barometer falls, and falls as the barometer rises. When the barometer has been falling for some time clouds begin to overspread the sky, and rain to fall at intervals; and, as the central depression approaches, the rain becomes more general, heavy, and continuous. After the center of the storm has passed, or when the barometer has begun to rise, the rain becomes less heavy, falling more in showers than continuously; the clouds break up, and fine weather ushered in with cold breezes ultimately prevails. It should be here remarked that, if the temperature begins to rise soon and markedly after the storm has passed, a second storm may be expected shortly. The rainfall is generally proportioned to the suddenness and extent of the barometric depression at the place where it falls.

Observations of the Wind.—First as to the direction of the wind. If the winds in Storm II. on Nov. 2 be attentively examined they will be observed whirling round the area of low barometer in a circular manner, and in a direction contrary to the motion of the hands of a watch, with—and be this particularly noted—a constant tendency to turn inward toward the center of lowest barometer. The wind in storms neither blows round the center of lowest pressure in circles, nor does it blow directly toward that center, but takes a direction nearly intermediate, approaching, however, nearer to the direction and course of the circular curves than of the radii to the center. The greater the force of the wind is at any place it will be observed to approach the more nearly the direction here indicated. And where the direction of the wind differs to any material degree from this general law, it is light, and consequently more under local influences, which turn it from its course. Thus, the center of the storm being near Liverpool, the direction of the wind is s.w. at Paris, s. at Yarmouth, n.e. at Silloth, n. at Dublin, and n.w. at Cork—instead of s. at Paris, s.e. at Yarmouth, n. at Silloth, n.w. at Dublin, and w. at Cork, if it had blown directly to the area of lowest pressure; and w. at Paris, s.w. at Yarmouth, e. at Silloth, n.e. at Dublin, and n. at Cork, if it had circulated in the direction of the isobarometric curves. Hence in this storm the winds circulate round the center of least pressure, or, to speak more accurately, the whole atmospheric system flows in upon the center in a spiral course. This rotatory peculiarity is common to all storms in the northern hemisphere that have yet been examined. In the southern hemisphere, a rotatory motion is also observed round the center of storms, but it takes place in a contrary direction, or in the direction of the motion of the hands of a watch, instead of contrary to that direction, as obtains n. of the equator.

Prof. Taylor has the merit of having first applied Duvé's law of rotation to explain the direction of the rotation of storms round their center. This may be explained by referring to Storm II. on Nov. 2. On that morning, the pressure over England being

much less than in surrounding countries, if the earth had been at rest, air-currents would have flowed from all directions to England, to fill up the deficiency, in straight lines. The earth, however, is not at rest, but revolves from w. to e.; and as the velocity of rotation diminishes as the latitude increases, it is evident that the current which set out, say from Lyon to the n., would, on account of its greater initial velocity when it arrived at Paris, blow no longer directly to the n., but to a point a little to the e. of n.; in other words, it would no longer be a s., but a s.w. wind. Again, since the current from the n. of Scotland had a less velocity than those parts of the earth's surface on which it advanced, it lagged behind, and consequently, by the time it arrived at Silloth in the n. of England, had changed from a n. to a n.e. wind. Similarly the n.w. current changed to a n., the s.w. to a w., etc. The w. and e. currents, since they continued in the same latitude, would have blown in the same direction, if they had not been disturbed by contiguous currents. Hence in a storm the whole system of winds rotates round the center. As a further confirmation of the truth of this theory, it is observed that when a high barometric pressure covers a limited space the wind is always observed gently *whirling out of this area of high barometer*, but in exactly opposite directions in both hemispheres from those assumed when it blows round and in upon an area of low pressure. It follows in the northern hemisphere that, as storms advance, the general veering of the wind at places lying n. of the path of their center is from n.e. by n. to w.; and at places s. of their center from n.e. by e. and s. to n.w., and conversely in the southern hemisphere.

Next, as to the force of the wind: The rule is simple, and without exception—viz., the wind blows from a high to a low barometer, and with a force proportioned to the difference of the barometric pressures. Hence, where the isobarometric lines crowd together, the violence of the storm is most felt, and where they are far asunder, the winds are moderate and light. We thus see the importance of observations from a distance in forecasting the weather. To take an illustration: the importance of observations from Norway and Sweden to all sea-ports on the e. coast of Great Britain cannot be overestimated. For if the pressure be high in Norway and low in Great Britain, violent easterly gales will sweep down on North Britain, and, unless foreseen and provided against, strew the coast with wrecks; whereas, if the pressures be nearly equal, little danger need be apprehended, even though the barometer be low in Britain. As the wind nears the center of the storm it gradually abates, till on reaching the center a lull or calm follows. Calms and light winds also prevail along the ridge of highest barometer, or the region where the pressure is greatest, and on receding from which the pressure diminishes on each side. It may not inaptly be compared to the water-shed in physical geography, since from it the wind flows away toward the places where the pressure is less.

We have stated that the progressive motion of storms varies from 15 to 40 m. per hour, which measures the time taken in passing from one place to another, but it gives no indication of the violence of the storm. This is determined by the rotatory velocity of the wind round the center of the storm, which in Europe and America frequently amounts to 60 or 80 m. an hour continuously for some time. In intermittent gusts, a speed of 120 m. an hour has been several times observed in this country—a velocity which is perhaps sometimes surpassed by storms within the tropics.

Of the different theories hitherto proposed, we need only refer to the rotatory and the centripetal theories. The rotatory, or, as it is commonly called, the cyclonic theory, was first proposed by Piddington, and has since been elaborated by Redfield, Reid, Dové, and others. By this theory storms are considered as revolving round an axis either upright or inclined to the horizon, while at the same time the body of the storm has a progressive motion over the surface of the globe; the barometric depression, as caused by the centrifugal force, driving the air from the center to the circumference of the storm. Dové, certainly the ablest advocate of this theory, holds that cyclones are formed when two atmospheric currents, the equatorial and polar, flow side by side, they being, as it were, the eddies formed at the line of junction. To this theory several objections may be urged. Observations from the numerous observatories recently established in Europe and America, in no case exhibit a true cyclonic movement of the winds round the center of the storm; that is, they do not rotate in circles returning on themselves, even when the barometric depression is deepening and the storm expanding, but invariably exhibit, along with the rotatory motion, a constant tendency to blow in upon the center of the lowest pressure. Hence it is clear that the barometric depression is not caused by the centrifugal force of the storm. The same may be shown from theory; for though the wind were to blow round a circle 400 m. in diameter at the rate of 70 m. an hour, the centrifugal force would depress the barometer at the center only $\frac{1}{800}$ in.; whereas half an inch, or even a whole inch of depression often occurs. Again, if cyclones arose from the flowing of the polar and equatorial currents side by side, the rotatory motion would not always be in one direction, but would be determined by the relative position and strength of the two currents. The whole facts of the rotation of the wind are explained when it is considered as caused by air currents flowing toward a low barometer along the globular surface of the earth rotating eastward.

The rotatory character of storms has been denied by Espy, who maintains that the wind blows from every quarter toward the center of the storm, and that the central depression is

caused by the development of heat which occurs whenever the vapor of the atmosphere is condensed into cloud or rain; the heat thus developed rarefying the surrounding air, and causing an upward current. The most valuable part of this theory lies in directing the attention of meteorologists to the heat of condensation, which must play an important part in the movements of the atmosphere. It is, however, insufficient, since it leaves some important points unexplained. Thus, more heat being set free when vapor is converted into snow than rain, a greater depression ought to follow a fall of snow than of rain, which is not found to be the case; it also leaves unexplained the appearance of high pressures, sometimes suddenly appearing on the scene, and seeming to divert the storm from its course, or drive it before them. But the weak point of this theory is the centripetal direction of the winds. Espy worked from imperfect data, and never being able to lay down the isobarometric lines, he could only guess at the true center of the storm; and further, he was misled by a peculiar characteristic of American storms, which being generally in the form of rather elongated ellipses moving *eastward*, many of the winds blow directly to the center, or nearly so.

STORNOWAY. See LEWIS WITH-HARRIS.

STORRES, CHARLES BACKUS, 1794-1833; b. Mass.; studied at Princeton college, but prevented by ill-health from graduating; graduated at Andover theological seminary, 1820; went to South Carolina and was ordained, 1821, by the Charleston Congregational association; settled at Ravenna, Ohio, 1822-28; elected professor of divinity in Western Reserve college, 1828, and president, 1831.

STORRES, RICHARD SALTER, D.D., LL.D., 1787-1873; b. Mass.; studied at Yale college, 1802-03; taught in Clinton academy, East Hampton, L. I., 1804-06; graduated at Williams college, 1807; studied theology a year at Andover, ordained pastor of the First church (Congregational) at Braintree, Mass., 1811, where he preached 62 years. He published *Memoir of Rev. Samuel Green*; a *Discourse on the Fiftieth Anniversary of his Ordination*; and 20 single sermons. He edited the *Boston Recorder*, was co-editor of the *Congregationalist*, and contributed to the *Panoplist*, *Home Monthly*, etc. He had wide repute as a vigorous thinker and preacher.

STORRES, RICHARD SALTER, D.D., LL.D., b. Mass., 1821; graduated at Amherst college, 1839, and Andover theological seminary, 1845; was ordained pastor of the Harvard Congregational church, Brookline, Mass., the same year; pastor of the church of the Pilgrims, Brooklyn, N. Y., 1846. He was co-editor of the *Independent*, 1848-61. He has published *Graham Lectures on the Wisdom, Power, and Goodness of God as Manifested in the Constitution of the Human Soul*; lectures on *The Conditions of Success in Preaching Without Notes*; *Life and Letters of the Rev. Daniel Temple*; *Report on the Revision of the English Version of the Bible, undertaken by the American Bible Society*; *Six Lectures Delivered at the Brooklyn Institute*; *Annual Address before the Society of Inquiry, Union Theological Seminary, New York*; *Early American Spirit and the Genesis of it*; *John Wycliffe and the First English Bible*; *Manliness in the Scholar*; *Psalter, with form of Service adopted by the Church of the Pilgrims*; *Recognition of the Supernatural in Letters and in Life*; and many occasional discourses, sermons, and orations. He ranks among the foremost pulpit orators in America, being unsurpassed for rhetorical magnificence and affluent and splendid diction in unwritten address.

STORRES, WILLIAM LUCIUS, LL.D., 1795-1861; b. Middletown, Conn.; brother of H. R. Storrs. He graduated at Yale college, 1814; studied law at Whitestown, N. Y.; admitted to the bar, 1817; resided in Middletown; member congress, 1829-33, and 1839-40. In the latter year he was appointed associate judge of the state supreme court of errors; chief-justice, 1856; professor of law in Yale college, 1846-47. His decisions are printed in the *Connecticut Reports*.

STORTHING (from *stor*, great, and *thing*, court), the legislative assembly of Norway (q.v.).

STORY, a co. in central Iowa, drained by Montgomery and Indian creeks and the Skunk river; traversed by several branches of the Chicago and Northwestern railroads; 576 sq. m.; pop. '90, 18,127, chiefly of American birth. The surface is rolling. The soil is fertile. The principal productions are corn, wheat, oats, and hay. Co. seat, Nevada.

STORY, JOSEPH, an American jurist and judge, was b. at Marblehead, Mass., Sept. 18, 1779; was educated at Harvard college, and, though admitted to the bar in 1801, gave his attention chiefly to general literature and poetry. Having published a volume in 1804, *The Power of Solitude*, and other poems, which met with no success, he bade farewell to the muses, and devoted himself to law and politics. Elected to the state legislature in 1803, he became a leader of the republican, or, as it was afterward called, the democratic party, and defended the measures of Jefferson. In 1808 he was elected to congress, where he gave a moderate support to the war measures of Mr. Madison, who, however, in 1811, appointed him associate justice of the supreme court of the United States, a place he filled with great credit for 34 years. In 1820, as a member of the Massachusetts constitutional convention, he advocated a property basis for the senate. In 1829 he became law professor at Harvard. His later politics were of the federalist school of Washington and Hamilton, and these tincture his *Commentary on the Constitution of the United States*. His *Conflict of Laws*, and other legal treatises, have passed

through many editions. His legal writings and decisions are among those oftenest quoted in the higher courts of law. He died Sept. 10, 1845.—In 1854 appeared Story's *Miscellaneous Writings*; and in 1851 a life of him by his son William Wetmore Story.

STORY, ROBERT HERBERT, b. at Rosneath, Dumbartonshire, Scotland, Jan. 28, 1835. Studied at the universities of Edinburgh, St. Andrew's, and Heidelberg; was appointed assistant minister of St. Andrew's Church, Montreal, Canada, 1859; succeeded his father as minister of Rosneath, 1860-87. Since 1887 he has held the chair of church history in the university of Glasgow; has edited the *Scottish Church* since it was founded in 1885, since 1894 has been moderator of general assembly, and has been one of H. M.'s chaplains since 1886. Among his publications are *Robert Story of Rosneath, a Memoir* (London, 1862), *Christ the Consoler* (Edinburgh, 1865), *Life and Remains of Robert Lee, D.D.* (London, 1870), *William Carstairs* (1874), *Creed and Conduct, Sermons* (1878), *Health Haunts in the Riviera* (Paisley, 1881), and *Nugæ Ecclesiasticæ* (Edinburgh, 1884).

STORY, WILLIAM WETMORE, b. Mass., 1819; son of Joseph; educated at Harvard college, and admitted to the bar. After the publication of several legal treatises he devoted himself to literature and sculpture. In 1848, he removed to Rome, Italy, where he has since resided. Among his sculptures are the marble statue of his father at the chapel of Mt. Auburn cemetery, statues of Edward Everett and Josiah Quincy, busts of Theodore Parker and James Russell Lowell, and many ideal works and groups, including a "Semiramis," a "Sibyl," a "Sappho," a "Cleopatra," and "Jerusalem." Among his prose writings are *Life and Letters of Joseph Story* (1851); *Roba di Roma* (1862); *Proportions of the Human Figure* (1866). Among his works in verse are *Poems* (1856); *Graffiti d'Italia* (1869); *The Roman Lawyer in Jerusalem* (1870); *Tragedy of Nero* (1875); *Stephanie* (1877); *Fiametta and Poems* (1886); *Conversations in a Studio; Excursions in Art and Letters* (1891). He d. 1895.

STOSCH, ALBRECHT VON, b. Prussia, 1818; received a military education, and was commissioned lieut. in 1835; displayed great proficiency in the technical and economical branches of the service; rose in rank and became tutor of the crown prince. In 1866 he was appointed director of the economy department in the war ministry, and in the war with France, 1870-71, was superintendent of the Prussian commissary department, and chief of staff in the army left in France after the conclusion of peace. In 1872 he was appointed chief of the naval department, then first separated from the army; and in 1875 received the title of admiral.

STOTHARD, THOMAS, R.A., an eminent designer and painter, was the son of a London publican, who kept the *Black Horse* in Long Acre, and was b. there in 1755. He received a respectable education in different boarding-schools, and on his father's death, having shown a predilection for the use of the pencil, was bound apprentice to a pattern-drawer in the city, but was released from his engagement before the term of expiry, and betook himself to more artistic work. His first notable effort was a series of designs for the *Town and Country Magazine*, which was followed by his imaginative compositions for Bell's *British Poets* and the *Novelist's Magazine*. The popularity of these was so great that for many years his services were constantly in request by the leading publishers in London. His earliest pictures exhibited at the royal academy were "The Holy Family," and "Ajax defending the Body of Patroclus." In 1791 he was chosen an associate, in 1794 a member, and in 1813 librarian of the academy. He died April 27, 1834. Stothard was really an admirable and facile illustrator. Not less than 3,000 of his designs are known; but his paintings, although gracefully enough "composed" and finely colored, are destitute of the originality that comes from a study of nature, and painfully resemble enlarged "illustrations" for books. Perhaps the best known and the most agreeable of the set is his "Canterbury Pilgrims," engraved in 1817; others are the "Flecht of Bacon," the "Fête Champêtre," and the paintings executed for the staircase at Burreigh, the seat of the marquis of Exeter. See Mrs. Bray's *Life of Thomas Stothard, R.A., with numerous Illustrations from his Works* (1851).—His son, **CHARLES ALFRED STOTHARD** (b. 1786, d. 1821), was an antiquarian draughtsman.

STOUGHTON, a town in Norfolk co., Mass.; on the New York, New Haven, and Hartford railroad; 18 miles s. of Boston. It was incorporated in 1726; contains the villages of Stoughton, North Stoughton, West Stoughton, Belcher's Corner, and Dry Pond; and has a public library, public park, electric lights, electric street railroad, and manufactories of shoes, hosiery, leather, and woolen and rubber goods. Pop. '90, 4852.

STOUGHTON, EDWIN W., LL.D., b. Vt., 1818; studied law in New York city and was admitted to the bar in 1840. He soon acquired an extensive practice in the metropolis, especially in patent cases. In the argument before the electoral commission following the presidential election of 1876, he was counsel for the republican side. In 1877 he was made U. S. minister to Russia by President Hayes, and returned in 1879. D. 1882.

STOUGHTON, ISRAEL, about 1580-1645; b. England; one of the first settlers of Dorchester, Mass., and member of the first general court, 1634. He was disabled from holding office for publicly denying the powers of the governor in certain matters. He commanded the expedition of 1637 against the Pequots, was in 1641 a commissioner to carry on the government of New Hampshire, and was governor's assistant, 1637-42, and in 1644. In the last year he returned to England and became an officer in the army.

STOUGHTON, WILLIAM, 1632-1701; b. England; graduated at Harvard in 1650. In 1650 he went to England; was a fellow of New college, Oxford; lost his fellowship at the restoration and returned to Massachusetts in 1662. He was agent in England for the colony, 1677-79, and was elected governor 1689, but refused the office. He was a member of the council of sir Edmund Andros, 1686-89, when he joined the council of safety which deposed Andros. In 1662 he was lieut.-gov., and the same year was appointed chief-justice of Massachusetts. Stoughton hall at Harvard college is named after him.

STOUGHTON, WILLIAM L., b. N. Y., 1827; studied law and practiced in Sturges, Michigan. In 1861 he was U. S. district attorney. He became col. of a Michigan regiment, and fought with distinction at Stone river, Chickamauga, and Atlanta, losing a leg at the last place. He attained the rank of brev. maj.gen. of volunteers, and at the close of the war became attorney-general of Michigan; in congress, 1869-73.

STOURBRIDGE, a market-t. in the co. of Worcester, and 20 m. n.e. of the town of that name, on the left bank of the Stour. It contains iron-works and glass, earthenware, and fire-brick factories. "Stourbridge clay," upon which the action of fire has less effect than upon most varieties of clay, is an article of export. Glass-house pots, crucibles, etc., are made of it. Pop. '91, 9386.

STOUTHRIEFF, in the law of Scotland, means robbery committed in a dwelling-house.

STOVE, a fireplace in which the fire is generally quite shut in. The term is also applied to a room or closet heated for the purpose of drying and other operations, and to hot-houses, in which the artificial heat is constantly maintained at a high temperature. Stoves for domestic purposes will be noticed under the head of **WARMING AND VENTILATION**. Particular kinds of hot-house stoves are already noticed in the articles **BARK-STOVE** and **DRY STOVE**. Stoves are also used for *forcing* fruits, so as to procure them in winter or spring. In the management of stoves, the general rule is that the temperature must never be allowed to fall below 60° Fahr. The free access of air is, of course, desirable, but the windows are not opened unless the temperature reaches 70° Fahr., and care must be taken that cold blasts do not enter, which are often very injurious.

STOW, or **STOKE** (A.-S. *stoc*, a stockaded place), a component element of many names of places, as Bristow or Bristol, Stockholm.

STOW, BARON, D.D., 1801-69; b. N. H.; graduated Columbian college, D. C., 1825; ordained pastor of a Baptist church, Portsmouth, N. H., 1827; pastor of Baldwin-place church, Boston, 1832, and of Rowe street church, 1848-67. He published *Daily Manna for Christian Pilgrims*; *Christian Brotherhood*; *The Whole Family in Heaven and Earth*; *Memoir of Harriet Dow*; *History of the Danish Missions on the Coast of Coromandel*; *History of the English Baptist Mission to India*; *First Things*; *Helon's Pilgrimage*; *Missionary Enterprise*. He edited *Columbian Star*, 1825-27; was recording secretary of missionary conventions, 1838-46.

STOW, JOHN, one of the earliest and most diligent collectors of English antiquities, was b. in London in the year 1525. He was brought up to his father's trade of a tailor in Cornhill, but ultimately abandoned it for antiquarian pursuits. Writing in 1575, he says: "It is now ten years since I, seeing the confused order of our late English chronicles, and the ignorant handling of ancient affairs, leaving mine own peculiar gains, consecrated myself to the search of our famous antiquities." A patriotic sacrifice, which ought to have insured to the devoted antiquary from his king and country an old age of ease and honor, but which only brought him to want and beggary! In his 79th year, Stow obtained letters-patent from James I. authorizing him to become a mendicant, or, as it is expressed in the state document, "to collect amongst our loving subjects their voluntary contributions and kind gratuities." He died April 5, 1604, and was buried in the parish church of St. Andrew Undershaft, in Aldgate ward, where his monument of terra-cotta, erected at the expense of his widow, may still be seen. The principal works of Stow are his *Summary of English Chronicles*, first published in 1561, and subsequently reprinted every two or three years, with a continuation to the date of each new publication; *Annals of England*, 1580, and reprinted in 1592, to which year the annals are brought down; and *A Survey of London*, the most important of his writings, published in 1598. Besides these original works, Stow assisted in the continuation of Holinshed's Chronicle, Speght's edition of Chaucer, Leland's *Collectanea*, etc. He had collected or transcribed a vast number of MSS., and much valuable information which might otherwise have perished; and in the use of his stores he was liberal to others, while as an original historian he was faithful and impartial.

STOWE, CALVIN ELLIS, D.D., b. Mass., 1802; graduated Bowdoin college, 1824; Andover theological seminary, 1828; assistant professor at Andover, and assistant editor of *Boston Recorder*, 1828-30; professor of languages at Dartmouth college, 1830-33; of Biblical literature, Lane theological seminary, 1833-50. In 1836 he visited Europe in behalf of Ohio, to examine the German public-school system, and on his return published a report on *Elementary Education in Europe*, and subsequently reports on *Education of Immigrants*; *The Course of Instruction in the Primary Schools of Prussia*; *Elementary Instruction in Prussia*; divinity professor in Bowdoin college, 1850-52; professor of

sacred literature in Andover, 1852-64. Among his works are *History of the Hebrew Commonwealth*, from the German of Jahn; *Lectures on the Sacred Poetry of the Hebrews* from the *Prælectiones* of Louth; *Introduction to the Criticism and Interpretation of the Bible*; *Origin and History of the Books of the Bible*. He published papers in *Spirit of the Pilgrims*, *Biblical Repository*, *Bibliotheca Sacra*, *Atlantic Monthly*. He d. 1886.

STOWE, HARRIET ELIZABETH BEECHER, American author; third daughter of the Rev. Lyman Beecher, D.D.; was b. at Litchfield, Conn., June 14, 1812. Though unrestrained in her fondness for fiction when a child, her mind was often occupied with serious subjects, and when in her twelfth year she wrote a composition on the question, "Can the immortality of the soul be proved by the light of nature?" In 1823 she entered her sister's school at Hartford, and at the age of 15 became an assistant teacher. She accompanied her father to Cincinnati, and in 1834 began her literary career by writing *A New England Story*, in competition for a prize of \$50. This was afterwards included in *The Mayflower*, a volume of stories showing keen insight into New England character. In 1836 she was married to Prof. Calvin E. Stowe, and while at Brunswick wrote *Uncle Tom's Cabin* for the *National Era*, an anti-slavery paper published in Washington, intending to limit it to a few numbers. When published (two volumes, Boston, 1852; new edition, 1879), its success was so great that four stereotype editions of over 300,000 copies were sold in 4 years; 35 English editions were published; the English reprints circulated 500,000 copies; 37 translations (European and Asiatic) were made; and the story was extensively dramatized. As the truthfulness of her statements was denied by the southern press, she pub. in reply *A Key to Uncle Tom's Cabin* (1853). Visiting Europe, 1853, she was received with marked distinction, and was presented with a petition for emancipation signed by over 1,000,000 women of Great Britain and Ireland. Her experiences during this visit were recorded in *Sunny Memories of Foreign Lands* (Boston, 1854), in the compilation of which her brother Charles aided. Another anti-slavery novel, *Dred, a Tale of the Dismal Swamp* (1856), was republished as *Nina Gordon* (1866), but since issued under the original title. Then followed, *The Minister's Wooing*, a story of New England life in the 18th century (1859); *The Pearl of Orr's Island* (1862); *Agnes of Sorrento* (1862); *Little Foxes* (1865); *The Chimney Corner* and *Men of Our Time* (1868); and *Lady Byron Vindicated* (1869), a reply to a book pub. by the countess Guiccioli. Mrs. S. was, 1868-70, joint editor of *Hearth and Home*. She also pub. *Old Town Folks* (1869); *Sam Lawson's Fireside Stories*, and *My Wife and I* (1872); *Paganuc People* (1878); *Religious Poems*, several minor works, the last of these in 1881, and aided her son in preparing a *Memoir* of Prof. Stowe. In 1864 her husband removed to Hartford, Conn., which then became her home, though several winters were passed in Florida. See *Life* by her son (1889), and by Mrs. James T. Fields (1897). She died July 1, 1896.

STOWELL, WILLIAM SCOTT, Baron, the eldest brother of lord Eldon (q. v.), was b. at Heworth, Durham, Oct. 17, 1745. He was educated at Newcastle; went to Oxford in 1761, and became a college tutor. In 1779 he took the degree of D.C.L., removed to London, was called to the bar (1780), and admitted to the faculty of advocates at doctors' commons. Dr. Johnson introduced him to the Literary club, and he became well known in the most intellectual society of London. As an advocate he at once obtained a large practice, and his promotion was rapid. In 1788 he was appointed judge in the consistory court, knighted, and nominated a privy councillor. In 1798 he became judge of the court of admiralty, the highest dignity to which he could attain in his own branch of the profession. Both as an ecclesiastical and admiralty judge he won high distinction. He wrote no systematic treatise or text-book, but his judgments were admirably reported, and supply the best evidence of his extensive legal learning, his sagacity, and his great literary ability. He is the highest English authority on ecclesiastical law and the law of nations, and his judgments—those especially relating to the rights of belligerents and neutrals—have been described as the most valuable contribution made by an English judge to general jurisprudence since the time of lord Mansfield. As a politician sir William Stowell was not remarkable. He represented Oxford in the house of commons for 20 years, but he took no part in the business of parliament, although like his brother he was a zealous supporter of the conservative party and the established church. At the coronation of George IV. he was raised to the peerage under the title of baron Stowell of Stowell park. In 1828 he retired from the bench, and in 1836 died.

STOW MARKET, a small market t. of Suffolk, on the Gipping, 12 m. n.w. of Ipswich. Iron, leather, paper, and gun-cotton are manufactured. The Gipping is navigable to Stowmarket. Pop. '91, 4339.

STRABANE, a market t. of the co. of Tyrone, Ireland, on the river Mourne, 130 m. n.w. from Dublin, with which it communicates by railway. It communicates with Londonderry, and thus with the sea, by canal and river. The chief industry is connected with the linen trade, and there is also a valuable fishery. Pop. '91, 5013.

STRABISMUS. See SQUINTING.

STRABO, an ancient geographer, b. at Amasea in Pontus, about the middle of the 1st c. B.C. By the mother's side he was of Greek descent, and also closely connected with the Mithridatidæ; of his father or his father's family nothing is known. How the name Strabo ("squint-eyed") must have originated is obvious, but whether any of the family were so called before him is uncertain. Strabo was well educated under the grammarians, Tyrannio of Amisus in Pontus, and Aristodemus of Nysa in Caria, and the phil-

osopher Xenarchus of Seleucia in Cilicia. He does not appear to have followed any professional calling, but to have spent his life in travel and study, from which it may safely be inferred that he was possessed of wealth, or at least of considerable means. He died some time after 21 A.D., but how long we have no evidence to show. Strabo's *Geography* is a work of great value, in those parts especially which record the results of his own extensive observation. "Westward," he says in a passage in the 2d book, "I have traveled from Armenia to the parts of Tyrrhenia adjacent to Sardinia; toward the south, from the Euxine to the borders of Ethiopia. And perhaps there is not one among those who have written geographies who has visited more places than I have between these limits." Yet it must not be supposed that he describes with equal accuracy or fullness all the countries of whose geography he treats. Some he seems to have visited hurriedly, or in passing elsewhere; others he knows like a native. For example, his accounts of Greece, particularly the Peloponnesus, are meager in the extreme, and of many of the obscurer regions he writes chiefly from hearsay. He makes copious use of his predecessors, Eratosthenes, Artemidorus, Polybius, Posidonius, Aristotle, Theopompus, Thucydides, Aristobulus, and many other writers now lost to us, but he strangely depreciates the authority of Herodotus, and quotes few Roman writers except Fabius Pictor, and Julius Cæsar. The *Geography* comprises 17 books, of which the first two are introductory, the next eight are devoted to Europe, the six following to Asia, and the last to Africa. The style is pure and simple. The *editio princeps* of Strabo appeared at Venice in 1516; the latest and best is that by Gustaf Kramer (Ber. 1844, *et seq.*).

STRACHEY, WILLIAM, b. England, 1585; secretary of the colony of Virginia, 1610-12. He was shipwrecked on the Bermuda islands in 1609 with sir T. Gates, Somers, and Newport. His *True Reportory of the Wracke and Redemption of Sir Thomas Gates, upon and from the Islands of Bermudas*, is supposed to have suggested to Shakespeare the storm in the *Tempest*, and the allusion to the "still vext Bermoothes." He collected *For the Colony in Virginia Britannia Lawes Divine, Morall, and Martiall* (1612;) and wrote a *Historie of Travaile into Virginia*.

STRADELLA, a city of northern Italy, 10 m. s.e. of Pavia. Pop. '81 (communal), 8540 inhabitants. A monument has recently been erected to the statesman Depretis, who died here in 1887. Stradella was formerly a fortified city, depending on the bishops of Pavia.

STRADELLA, ALESSANDRO, a Neapolitan musical composer, b. about 1645; he is famous both in respect of his influence on the music of that age and of the tragical history of his life and death. His works, which consist of numerous airs, duets, cantatas, madrigals, an oratorio, and an opera, contributed largely to form the taste of the succeeding composers, particularly Purcell, Clari, Steffani, and Alessandro Scarlatti. Stradella was renowned for his exquisite voice and polished manner; and when engaged in Venice, instructing a young lady of rank, who lived in a criminal intimacy with a noble Venetian, the musician and his pupil became mutually enamored, fled to Rome, and were married there. They were traced thither by two bravos in the employ of the Venetian, who discovered them in the church of San Giovanni Laterano, where Stradella was assisting at the performance of an oratorio of his own, and both assassins, it is said, were so captivated with his voice and strains, that they at once abandoned their object and betrayed to him the plot in which they had been engaged. Pursued by other bravos to Turin, Stradella was stabbed, but not mortally, when lodged in the palace and under the protection of the duchess of Savoy. Some years afterward, however (about 1681), he went to Genoa, in pursuance of an engagement to compose an opera, and the day after his arrival both he and his wife were mortally stabbed in their bedchamber by the emissaries of their unrelenting persecutor.

STRADIVARIUS, ANTONIO, 1644-1737; b. Cremona; was a pupil of Niccolò Amati, and at first reproduced violins in the style of his master. In 1686 he acquired his own peculiar style, which subsequent makers of violins have deemed a model. He produced violins, violas, and violoncellos. He also made some viols of 6 and 7 strings, mandolins, guitars, and lutes. One of his violins, *La Pucelle*, has been preserved under glass, and has never been touched by the bow. Another specimen, the *Dolphin*, so called from the veined wood of its back, is the best Stradivarius violin in existence, and formerly belonged to the marquis de la Rosa.

STRAFFORD, a co. in s.e. New Hampshire, adjoining Maine, watered by the Lamprey, Cocheco, Piscataqua, and Salmon rivers; traversed by several branches of the Boston and Maine railroad; about 376 sq. m.; pop. '90, 38,442, chiefly of American birth. The surface is irregular. The soil is not fertile. Hay, butter, and potatoes are principal productions. There is much water-power and manufacturing. Co. seat, Dover.

STRAFFORD, THOMAS WENTWORTH, Earl of, eldest son of sir W. Wentworth of Wentworth, Woodhouse, Yorkshire, was b. April 13, 1593. In 1611 he married lady Margaret Clifford, eldest daughter of the earl of Cumberland. Subsequently he was chosen member of parliament for the co. of York. In 1615 he was appointed *custos rotulorum* for the West Riding of the same county. Being again returned to parliament for Yorkshire in 1621, shortly after his election he took up his residence in Lon-

don. Slighted by the duke of Buckingham, who then ruled the court and cabinet of Charles I., Wentworth signalized himself as an opposer of the administration. In 1626 he was made sheriff of his county, with the view of preventing him from attending parliament. So resolutely did he oppose the arbitrary royal loan, exacted in the following year, that the government deemed it advisable to put him in prison. But Buckingham was little aware of the energy of his opponent. Strafford, having obtained his release, came to the following parliament, resolved to make his power felt both by king and minister. He spoke eloquently on the question of grievances, and was conspicuous in obtaining the royal assent to the petition of right. He was obviously a man worth gaining; and his patriotism, if it had any genuine element, was, unhappily not strong enough to withstand the temptation now held out to his personal ambition. With his elevation to the peerage as baron Wentworth, in 1628, he seems not only to have lost all solicitude for popular liberty, but openly to have become its most determined enemy. As president of the "council of the north," he seems to have abused his powers not only for political purposes, but often simply to gratify his own pride. The legality of the jurisdiction exercised by the council created by Henry VIII. was altogether very doubtful, and interdicts against it were at various times applied for from the courts at Westminster. Strafford declared openly that he would "lay by the heels" any judge presuming to interdict the council from the exercise of such powers as he chose to hold that it possessed. Nevertheless, this was done by judge Vernon. In 1631 Strafford was made deputy of Ireland, and in 1639 earl of Strafford and lord lieutenant of Ireland. According to his views, that country belonged to the crown by right of conquest, and neither the natives nor the descendants of the conquerors themselves had any rights which could interfere with its sovereignty. His government was of despotic violence, but the administration of justice, in ordinary cases, was prompt and vigorous. Outrage was suppressed and commerce flourished under his strong hand. Understanding fully the feelings, policy, and resources of the party to which he had originally belonged, Strafford had matured a vast political scheme, to which, in his confidential correspondence, he gave the expressive name of "thorough." His object was to do in England what Richelieu was doing in France—to make Charles as absolute as any continental monarch; to put the estates and personal liberty of the whole people at the disposal of the crown; to deprive the courts of law of all independent authority; and to punish with merciless severity all who murmured against the government, or who applied to any tribunal for relief from its despotism. Happily the people of England were too strong for him. On his entering the house of peers on the meeting of the long parliament in 1640, the message from the house of commons was called in, and Mr. Pym, in the name of the commons of England, impeached "Thomas, earl of Strafford," of high treason. This course was afterward abandoned, and the commons proceeded by bill of attainder. It passed the house on April 21, 1641. Immediately after it passed in the house of lords, and received the royal assent. Strafford certainly merited his fate, but nothing can excuse the cowardice of the king. The earl was executed on May 12, 1641. The attainder was reversed in the reign of Charles II., and his son succeeded to the honors. See Hallam's *Constitutional History*; Macaulay's *History of England*, with authorities cited in these works.

STRAIGHT UNIVERSITY, in New Orleans, was founded by Mr. Seymour Straight exclusively for colored students. It was organized in 1869 under the auspices of the Congregationalists. It has about 22 instructors and 600 pupils.

STRAIN, ISAAC G., 1821-57; b. Penn.; entered the navy. In 1845 he explored Brazil, in 1848 Lower California, and in 1849 South America between Valparaiso and Buenos Ayres. He afterward led an expedition across the isthmus of Panama to find a route for a ship canal. This expedition suffered greatly from hardships. In 1856 he made soundings to show the feasibility of an Atlantic cable.

STRAITS SETTLEMENTS are the British settlements in the straits of Malacca, comprising Singapore (q.v.), Malacca (q.v.), and Prince of Wales (q.v.), or Penang, including the Province Wellesley and Dindings. Area, 1472½ sq. miles; pop. '91, 507,696. In addition to these, in 1896 the British government concluded a treaty with the native states Perak, Selangor, Pahang, and Negri Sembilan, by which these states were all brought into one confederation under the authority of a British Resident General. Area of this new territory, about 35,500 sq. miles; pop. 418,527. The Straits Settlements were transferred from the control of the Indian government to the colonial secretary in 1867. The seat of the government is at Singapore.

STRAKOSCH, MAURICE and MAX, two brothers well known in the U. S. as impresarios and conductors. The eldest, Maurice, b. Lemberg, 1825, organized various concert and opera troupes, which visited the U. S., 1855-59. In the latter year he brought out Adelina Patti, whose success was so great that he took her on a tour through Europe. He subsequently married her sister Amalia. On Maurice's departure, Max, who had hitherto acted as business agent for his brother, became manager, in his turn, of numerous Italian and English opera companies, and introduced to the American public many famous modern singers. Maurice S. d. 1887; and Max in 1892.

STRALSUND, a fortified t. and seaport of Prussia, province of Pommern, is situated on a narrow strait called the Strela Sunde, which divides the mainland from the island of Rügen. It forms an island, partly surrounded by the sea, and partly by large pools of salt water, and is connected with the mainland by three moles. The natural strength of the place is greatly increased by formidable fortifications, which, however, have recently been in part removed. Right in front of the harbor lies the fortified island of Dänholm. Stralsund has narrow, but pretty regular streets, and many of the houses are finely gabled, giving the town a quaint and ancient look. Stralsund carries on a large export trade, and produces leather, gloves, sugar, starch, mirrors, canned fish and vegetables, earthenware, and playing cards (the United Stralsund card manufactory producing nearly two million packs a year). Pop. '95, 30,097.

STRAMONIUM, the specific as well as common name of *datura stramonium*, otherwise called Jamestown weed, jimson weed, and thorn-apple. The *datura* is a genus of *solanaceæ*, or the nightshade family, which includes the common potato, tomato, egg-plant, bitter-sweet, common nightshade, horse-nettle, ground cherry, and tobacco. *Stramonium*, or Jamestown weed, is very unequally distributed, being common in some localities, and rare in others; but it generally grows in abandoned gardens and waste places, especially where ashes have been dumped, or where the soil is rich in potash, for this is the mineral ingredient in which it delights, as do the other members of the *solanaceæ*, especially the potato. In the suburbs of some cities (e.g., Brooklyn) it grows luxuriantly alongside old piles of ashes. Generic characteristics: calyx prismatic, 5 toothed; corolla funnel form, with a large and spreading 5 to 10 toothed, plaited border; stigma two lipped; pod globular, prolate, one and a half to two inches long, prickly, 4 valved, 2 celled, with thick placenta, projected from the axis into the middle of the cells, and connected with the walls by an imperfect false partition, so that the pod is 4 celled, except near the top; numerous flat, angular, black seeds, which contain a powerful narcotic poison, having peculiar properties. Its native country is not known, but most botanists believe it to be Asia. De Candolle refers it to the countries bordering on the Caspian sea; others regard it as coming from northern India. It is a coarse, strong, vigorous, branching weed, growing from two to 6 feet high (in rich ground), leaves ovate, sinuate toothed, or angled. The alkaloid *daturia* was found in the seeds by Geiger and Hesse in 1833, and subsequently in other parts of the plant. Von Planta in 1850 pronounced this alkaloid to be identical with atropia in composition, solubility, and fusibility; but the physical experiments of Von Schroff in 1852 showed that the two alkaloids, though acting qualitatively alike, are very unequal in their effects, *datura* being about twice as strong as atropia (the active principle of belladonna). Trommsdorff obtained *stramonium* as a white, tasteless powder, insoluble in water, soluble in ether, sparingly soluble in alcohol. The other constituents of the seeds are about 25 per cent of a bland, fixed oil, mucilaginous, resinous, and other common principles. The physiological action of stramonium varies with the animal to which it is given. Several kinds of caterpillars devour it without injury, and goats browse upon it. A decoction of the leaves applied to the skin of a young rat has produced alternate debility and convulsions. Large doses given to horses have produced drowsiness and even death. On man, stramonium and belladonna are almost identical in their action. The powdered leaves of stramonium in two-grain doses increase the fullness and frequency of the pulse, make the skin warm and the hands and face moist. Five-grain doses produce dilatation of the pupils, difficulty of speech, nausea, thirst, dryness of the throat, catharsis, increased flow of urine, and feverishness. Larger doses cause high fever and delirium, the patient sometimes becoming violent. There is dizziness, and the face is much flushed and often swollen, the eyes bright, the conjunctiva red, the pupils dilated and the sight confused. Sometimes the skin is covered with a bright red eruption, which may be followed by minute vesicles, or have the appearance of erysipelas or of measles. Sometimes there are hydrophobic phenomena, and convulsions will occur on attempting to drink. In rare fatal cases, the phenomena of excitement are succeeded by stupor, insensibility, and sometimes paralysis. There is, in no case, any tendency to sleep but, on the contrary, persistent insomnia. Among the perversions of the senses, is that of all black objects appearing green. At one time stramonium was believed to be a valuable remedy in insanity, but not now, although there are isolated cases where its use has been attended with benefit. In some cases of epilepsy it is useful. In spasmodic asthma there is no doubt of its frequent beneficial action. The skepticism in regard to this has no doubt arisen from failure to diagnose the variety of asthma. To be of use it must be given in the purely spasmodic cases. The common method of administration is smoking the dried leaves in a tobacco-pipe, or inhaling the smoke from a chafing-dish. It has been used internally to relieve whooping-cough, dysmenorrhœa, and retention of urine. In the absence of belladonna, or atropia, it may be used to produce dilatation of the pupil in ophthalmoscopic operations. The physiological and clinical antidote to stramonium is opium or its alkaloid morphia. Sometimes 15 grs. of muriate of morphia have been given.

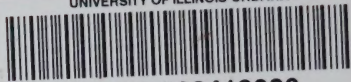
STRANGE, Sir ROBERT, eminent as an engraver, was born in Pomona, one of the Orkney islands, July 14, 1721. After some little abortive study of law at Edinburgh, he was apprenticed to an engraver there of the name of Cooper, under whom he made rapid progress. In 1745 he deserted art for arms, joining the army of Charles Edward, not so much from enthusiasm in his cause, as to find favor with a Miss Isabella Lumisden, who would only consent to be gracious to him on that romantic condition. The only exploit

recorded of him in this relation is not one of glorious battle. After the final collapse of the adventure, he was in hiding in the house where Miss Lumisden resided; and on occasion of its being searched by the soldiery, he shrouded himself under the folds of her ample petticoat, and thus cleverly evaded detection. It is extremely satisfactory to know that very soon after the lady requited his heroism by marrying him. He now went abroad with his wife, and at Paris he prosecuted his art under the tutelage of the celebrated Le Bas, and afterward of Descamps. In 1751 he returned to Britain, and settling himself in London, speedily attained the very highest rank in his profession. On again going abroad in 1760 to execute plates of the most famous pictures of the old masters, his eminence was recognized by the academies of Paris, Rome, Florence, Bologna, and Parma, all of which conferred on him the honor of membership; and subsequently in 1787, the distinction of knighthood testified to the high favor he found in his own country. After a life of honorable and successful industry, he died on July 5, 1792, leaving a handsome fortune to his family. To this day, Strange is ranked at the very head of British engravers, and his reproductions of the nobler specimens of the old masters are much prized by the connoisseur. In the very amusing work entitled *Memoirs of Sir Robert Strange, Knight, Engraver, and of his Brother-in-law, Andrew Lumisden, Private Secretary to the Stuart Princes* (2 vols., 1855), by James Dennistoun of Dennistoun, a full account will be found of him, with an intelligent criticism of his chief works.

STRANGE, ROBERT, LL.D., 1796-1854; b. Va.; educated at Hampden-Sidney coll.; studied law; established his practice in Fayetteville, N. C. He was, in 1822-23 and 1826, a member of the state house of delegates; 1826-36 was judge of the superior court; 1836-40 was U. S. senator. Resuming practice of his profession in Fayetteville, he became solicitor of the 5th judicial district of the state. The legends of the Cherokees were embodied by him in a novel entitled *Eoneguski*, privately circulated.



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